DOCUMENT RESUME

ED 231 378 IR 050 258

AUTHOR Hirshon, Arnold
TITLE Integrated Library Information Systems in ARL Libraries. SPEC Kit 90.
INSTITUTION Association of Research Libraries, Washington, D.C. Office of Management Studies.
PUB DATE Jan 83
NOTE 97p.
AVAILABLE FROM ARL Office of Management Studies, SPEC Center, 1527 New Hampshire Ave. N.W., Washington, DC 20036 (Library members, $7.50; non-members $15.00; Subscriptions are available).
PUB TYPE Collected Works - General (020) -- Legal/Legislative/Regulatory Materials (090) -- Reports - Research/Technical (143)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Academic Libraries; Cataloging; Databases; *Information Systems; Library Acquisition; *Library Automation; Library Catalogs; Library Circulation; *Library Planning; Library Surveys; *Online Systems; Questionnaires; *Research Libraries; Specifications
IDENTIFIERS Online Catalogs

ABSTRACT

Based on an October 1982 survey of 31 selected members of the Association of Research Libraries (ARL), this report presents library planning documents, general system descriptions and reviews, and examples of library specifications--all dealing with integrated library information systems (ILIS). An ILIS is defined as a fully interactive integrated database containing bibliographic and other data used for four functions: acquisitions, cataloging, maintenance, circulation, and provision of an online public access catalog. General planning and executive review documents are provided from the University of Tennessee, Knoxville; Duke University; the University of California at Berkeley; Virginia Polytechnic Institute and State University; the State University of New York at Albany; Dartmouth College; and the University of Houston. In addition the survey results are noted on a sample questionnaire. It is indicated that approximately 90% of the respondents reported some plans or actions toward developing an ILIS. A further discussion of survey results covers the areas of planning, justification, implementation, system data, hardware support, system funding, and the role of consultants in planning for an ILIS. A four-item bibliography and an evaluation sheet for this ARL Systems and Procedures Exchange Center (SPEC) kit are also provided. (ESR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

spec

January 1983

OMS

Systems and Procedures Exchange Center

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED231378

Integrated Library Information Systems in ARL Libraries

Kit 90

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Maxine Sitts

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR050258

The Systems and Procedures Exchange Center (SPEC) is operated by the Association of Research Libraries, Office of Management Studies, 1527 New Hampshire Avenue, N.W., Washington, D.C. 20036. Telephone (202) 232-8656.

spec

January 1983 #90

OMS

Systems and Procedures Exchange Center

INTEGRATED LIBRARY INFORMATION SYSTEMS IN ARL LIBRARIES

ISSN 0160 3574

As library automation has become more firmly entrenched, considerably more attention has been paid to developing systems that integrate the various library functions into one computerized system, rather than building standalone or single purpose systems that do not interact with other functions. In October 1982, SPEC conducted a survey of selected ARL members to investigate the directions being taken in this area. For purposes of the survey, an integrated library information system (ILIS) was defined as including the following:

(1) the four functions (acquisitions, cataloging maintenance, circulation, and the online catalog) rely on the same data without the need for rekeying, thus creating a single functional database;
(2) all functions are fully interactive with each other, with access to one file (e.g. cataloging) leading directly through the same terminal to other functions kept automatically in sychronization;
(3) the database is composed of bibliographic data (e.g., order records or cataloging records) as well as other data necessary to carry out library-related functions (e.g., vendor files for acquisition purposes, or borrower files for circulation).

A cross section of 31 ARL libraries representing those that had well-publicized efforts in library automation and those whose plans were not as well-developed or well-known took part in the survey. Approximately 90 percent indicated some plans or actions toward developing an ILIS. In general, the responses indicate that variations in ILIS implementation are occurring most frequently at the detailed procedural level, rather than at the policy level, with decisions focusing on the following areas. (More complete survey results can be found in the accompanying kit.)

PLANNING AND JUSTIFICATION. Staff involvement in planning for the ILIS occurs most commonly through the establishment of committees. A majority of libraries have established committees to oversee the development of the ILIS, and these committees usually are separate from the regular administrative group in the library. Primary responsibility for the development and implementation of the system does not rest with the committee; rather it rests most commonly with the director of technical services and/or automation, the head of library systems, the director of libraries, or the director of administrative services.

Libraries cited a variety of reasons to justify an ILIS, with a fairly even division between needs to improve technical processing and factors that most affect the public. Most frequently cited justifications were the increase in the amount of information that would be available to the public, the ability to provide distributed access to the bibliographic information, the improved access mechanisms (such as Boolean searching) that are possible through a computer, and the increased staff productivity that would result from simplifying the files to be accessed.

Of the factors that are seen to inhibit development of an ILIS, the greatest limitations are lack of funds and the high costs to develop and maintain the system. The lack of staff to perform the analysis, development and implementation also was found to be an inhibition, and there is a concern that the problems presented in library automation are still too advanced for the state-of-the-art.

IMPLEMENTATION. For the four basic functions to be included in an integrated library system, no one method for implementation seems to predominate at this time. While turnkey systems and local implementation are the two methods most favored, the local implementation is continuing mainly in those libraries that have had a substantial established efforts in the past. Libraries without such experience are opting primarily to go with library systems to mount locally. This trend holds with little variation based on the function to be automated. In this respect, binding control is the area where libraries have the greatest doubt how, or if, the function will be automated. There is still a significant sector of the surveyed libraries, however, that has not yet determined how implementation will be done, and a small number have no plans for an ILIS.

Of those libraries that will be putting an ILIS into place, the trend clearly is to implement the system in phases, rather than to attempt to bring up all functions simultaneously. Of the functions to be implemented, greatest interest is in first implementing cataloging maintenance and circulation, and later the online catalog and acquisitions.

SYSTEM DATA AND HARDWARE SUPPORT. To put an effective system into effect, most respondents believe that the system must contain the substantial (if not complete) portion of the library's collection in the database and prefer the inclusion of full bibliographic data. The greatest number of systems are, or intended to be, mounted onto dedicated library computers. The minicomputer generally is seen as the hardware configuration choice. Dedicated library mainframe computers are also anticipated in some libraries, but microcomputers are not envisioned as having the capacity at this time to support an ILIS in an ARL library. The use of a central campus computing facility, while not favored as heavily as the dedicated library computer, is still being (or to be) employed in approximately one-fifth of the responding libraries.

SYSTEM FUNDING. In the majority of responses, the anticipated sources of funding are from the university. While development and maintenance costs are expected to come from the regular budget, hardware and software costs (whether developed locally, or purchased from another source) are expected to come more from special allocations or outside grants or donations.

THE ROLE OF CONSULTANTS. The surveyed libraries do not show a pronounced inclination to employ consultants in the planning for an ILIS. Over half the respondents are not employing consultants in the ILIS development venture. Of those libraries that are, the greatest interest is in assistance with general decision-making, the analysis of specifications prepared by the library, hardware specification preparation, and implementation of the system.

Kit #90 on Integrated Library Information Systems (January, 1983, 88 pages) includes survey results, planning documents, general system descriptions and reviews, and examples of specfications. SPEC Kits are available mainly by subscription. Individual kits may be purchased when available for $15.00, with checks made payable to "ARL Office of Management Studies." Ordering address is: SPEC Center, ARL/OMS, 1527 New Hampshire Ave., N.W., Washington, D.C. 20036. Library members of ARL receive SPEC kits for $7.50.

This flyer/kit was prepared as a part of the
Collaborative Research/Writing Program by Arnold Hirshon,
Assistant Head, Cataloging Department, Duke University.

USES OF SPEC KITS

The Systems and Procedures Exchange Center (SPEC) is a clearinghouse operated by the Association of Research Libraries, Office of Management Studies that provides a central source of timely information and materials on the management and operations of large academic and research libraries. It facilitates the exchange of knowledge and documents through SPEC Kits, which are distributed ten times each year to ARL members and other interested libraries. The Kits include topically-arranged groupings of unedited primary source documents – selected for their value to administrators and decision-makers – that illustrate a wide range of alternative approaches to specfic issues.

Kit documents come from general membership surveys and from selected libraries contacted directly by SPEC, and most Kits are produced within six months of surveys. The documents' value comes from their variety of ideas, methods, and solutions. They are not viewed as finished products, but rather as points of departure for a library's planning efforts and as stimulants to innovative approaches to problem-solving. As such, Kits do not present answers or prescriptions for any one library; instead they illustrate how selected ARL members are planning for or dealing with particular issues. The worth of any one Kit to a particular library will depend upon the specific topic covered and the library's stage of development in that area.

Materials are selected according to the following criteria:

- Presents an approach of potential value to administrators and decision-makers
- Timely, and dealing directly with the topic under consideration
- Probability of application of ideas or thinking to other library situations
- Illustrative of actual practice, rather than theoretical
- Understandable, readable communication

All together, the materials should provide a range of alternative approaches that complement each other, provide variety, and stimulate comparison and contrast.

Libraries can take advantage of the Kit compilations in a number of ways. Administrators can evaluate the assumptions, methods, and results of other libraries' approaches; compare and contrast them; and use the learnings in their own situations. Library staff members can use the kits as professional development and current awareness tools. Committees and task forces can use them to begin a review of current practices. And the Kits can identify other persons or places to contact for further information. Back-up files in the SPEC office also are available for loan to member libraries. In addition, SPEC will conduct on-demand surveys or analyses geared specifically for a single library.

EVALUATION

Kit Title/Number _____

1. Which uses did the library make of this Kit?

2. Please indicate how useful the Kit was for these purposes.

☐ Very Useful ☐ Quite Useful ☐ Somewhat Useful ☐ Not Useful

3. Do you have suggestions for this Kit or for future Kits?

(optional)

NAME _____

LIBRARY _____

PHONE _____

Please return this form to the SPEC Center, OMS/ARL, 1527 New Hampshire Ave., N.W., Washington, DC 20036.

1/82

ISSN 0160 3582

Integrated Library Information Systems in ARL Libraries

SPEC KIT #90 JANUARY 1983

TABLE OF CONTENTS

PAGE

GENERAL PLANNING AND EXECUTIVE PROGRAMS

"Timetable for Implementing and Integrated Library System for the UTK Library: Memo to Vice Chancellor/Academic Affairs." University of Tennessee, Knoxville. 1981. 1

"Executive Summary" and "Recommendations." Duke University. 5

GENERAL SYSTEM DESCRIPTIONS AND REVIEWS

"Automation Overview." University of California at Berkeley. 15

"Brief Summary" 22
"Installation Policy"
"VTLS Information Form"
"Library Policy Information Request"
Virginia Polytechnic Institute and State University. 1982.

Selected Sections, "Task Force on Automation Planning for Circulation Final Report." State University of New York at Albany. 1982. 32

SPECIFICATIONS - MASTER RECORDS AND FUTURE SYSTEMS, FUNCTIONAL/SYSTEMS SPECIFICATIONS, EQUIPMENT AND SOFTWARE

"Master Bibliographic Record" from "Specifications for an On-Line Circulation System." University of Tennessee. 1981. 40

Selected Section, "A Request for Proposals Regarding an Automated Circulation System." Dartmouth College. 1982. 50

Selected Sections, "Invitation to Bid, Specifications for Furnishing, Delivery, Installation and Maintenance of an Integrated Library System." University of Houston. 1982. 57

SURVEY RESULTS with short bibliography. Prepared by Arnold Hirshon. 1982. 79

GENERAL PLANNING AND EXECUTIVE REVIEWS

FOR YOUR INFORMATION

LIBRARY
THE UNIVERSITY OF TENNESSEE
KNOXVILLE 37916

UNIVERSITY OF TENNESSEE

OFFICE OF THE DIRECTOR

October 22, 1981

MEMO to Dr. Ralph Norman, Associate Vice Chancellor/Academic Affairs
Timetable for implementing an integrated library system for the UTK Library

The ultimate goal of the UTK Library is the creation of an integrated library system (ILS). The conceptual as well as operational foundation of an ILS is the existence of a computerized database of bibliographic records that can be directly accessed by all users from remote locations for a variety of purposes. An ILS is made up of a number of modules providing the following services: acquisitions, fiscal monitoring, serials and binding control, cataloging, access to the collections, and circulation and inventory control.

The process of creating an ILS consists of two major channels of activity.

CONVERSION PROGRAMS

A. Converting print bibliographic records into computer-stored bibliographic records. This, in turn, has two segments: Monographic records and serial records. Work has been underway for some time on the retrospective conversion of monographic records. This will result in the computerized database of bibliographic records.

B. Linking of faculty and student database records to create a library-user file. Associated with this is the process of placing a bar code/OCR label on all faculty/student/staff identification cards.

C. Labelling of the library's collection with bar code/OCR labels and subsequent linking of item identification number with computer-stored bibliographic record.

HARDWARE AND SOFTWARE DEVELOPMENT

This second activity entails the preparation of the necessary specifications, RFPs, evaluation of bids, negotiation of a contract, and installation of equipment and software. This will be accomplished in four distinct phases:

Phase I. Circulation and reserve system for Hoskins and Hodges; File maintenance and update for Automated Processing

Phase II. Circulation for Ag/Vet Med and Music Libraries; Automation of Bindery and Interlibrary Services

Phase III. On-line catalog and automated acquisitions

Phase IV. Serials check-in and claiming control

The library is currently working on Phase I of the second activity, which is the acquisition of a mini-computer-based turn-key on-line circulation system. There is a degree of urgency in completing Phase I by May 1983, as the company that owns and services our Mohawk circulation equipment has informed us that after this date they will no longer maintain the equipment.

Following is the timetable for Phase I of the project and the projected timetables for the other three phases.

STEP	BRIEF DESCRIPTION	ESTIMATED TIME	DATES
1	Specifications: Write detailed bid specifications	8 months	June 1981-January 1982
2	Approvals: Obtain the internal approval of specifications (Purchasing, etc.)	1 month	February 1982
3	Bids: Specs go out on bid	2 months	March-April 1982
4	Review: Review bids received; possible demonstration by vendors	1 month	May 1982
5	Contract: Award bid/contract	2 months	June-July 1982
6	Preparations: Install equipment, build files, debug, train, etc.	6 months	August-January 1983
7	Implementation and Evaluation: Acceptance tests, parallel runs remove Mohawk equipment in UGL and Main	3 months	February-April 1983
8	Begin Phase II		May 1983--
	TOTAL TIME NEEDED	23 months	June 1981-May 1983

Functions and Equipment Requirements for All Phases

PHASE I

Functions:

1. Circulation control - Main, Undergraduate Libraries
2. Reserve control - Main, Undergraduate Libraries
3. File maintenance and update - Main Library: Automated Processing Dept.

Equipment requirements:

1 CPU - Minicomputer; minimum 256K core
2 Disk drives - 300 megabyte storage preferred
1 Printer - 300 lines per minute preferred
1 Tape drive - 9 track, 1600 bpi preferred
7 Terminals (CRT)
6 Scanners (wands attached tc CRT's)
* 3 Modems and communication lines

PHASE II: May 1983-April 1984

Functions:

1. Circulation control--Ag-Vet Med, Music Libraries
   Main: Binding and Interlibrary Services Departments
2. Reference Department access, all libraries
3. Public access familiarity--Main, UGL

Equipment requirements:

16 Terminals (CRT)
1-2 Small printer--Binding and Interlibrary Services
* 9 Modems and communication lines

Phase III: May 1984-April 1985

Functions:

1. On-line catalog--all libraries
2. Ordering, receiving, budget control for library materials

Equipment requirements:

29 Terminals (CRT)
* 18 Modems and communication lines

Phase IV: May 1985-April 1986

Functions:

1. Serials check-in and claiming control

Equipment requirements:

1-3 Terminals (CRT)
* 0-2 Modems and communication lines

* Multiplexors will likely be used to combine up to 6 terminals on one communication line.

Concurrently with Phases I and II, the conversion of bibliographic records will be occurring. The conversion of user records and the labelling of library materials must be essentially completed by May 1983.

The library estimates that cost of implementing Phase I, excluding conversion costs, will be $300,000. Total cost of the ILS would be spread over a 5-year period. Maintenance costs of 1-1½% of the hardware also needs to be anticipated.

Equipment Cost

Description	Total System Cost
1 CPU	$ 103,000
1 Tape Drive	16,200
4 Disk Drive (300 megabyte)	116,000
1 Printer	7,600
56 Terminals (estimated number)	196,000
1 Modem for Diagnostics	17,000
4 Pr. Line Drivers	4,000
Installation, Cables, etc., (estimate)	15,000
Software (estimate)	50,000
	$ 524,800

The cost of other modules in the ILS is open to considerable speculation because all turnkey vendors are in the development and test stages. A cost of at least $25,000 per module is probably a conservative estimate at this time.

Sincerely,

Don Hunt

Donald R. Hunt
Library Director

DRH:pw

11

Duke University
Durham
North Carolina 27706

William R. Perkins Library

EXECUTIVE SUMMARY

I. INTRODUCTION

As the collections, user populations and demands for library services at Duke University have grown, the management of bibliographic information has become more complex. At Duke University, the application of data processing techniques to improve operations has been implemented in a patchwork fashion. As a result, the automated systems currently in use are based on different techniques and there is no linkage among the various functions. The present study, which employed the Application Transfer Team (ATT) methodology developed by IBM, was to define a model system to be used in making future decisions concerning library automation.

The length of bibliographic and related records, the unique identification and detailed description of each physical piece in the library collection, and the need to exchange bibliographic information, both within the university as well as with libraries outside, make a library system particularly complex to implement.

The scope of this study was to develop a conceptual design for an integrated system based upon bibliographic information to ensure the effectiveness of library services at Duke. This design establishes what an information system should provide, not how that system should be implemented. The sudy will be used as a model against which possible implementation strategies should be measured and evaluated.

The study had five specific objectives: (1) to develop an understanding of the current environment and information needs of the libraries; (2) to define the functions to be supported by the system; (3) to promote cooperation, including the sharing of data (as appropriate) given the constraints of the various constituent library organizations; (4) to assess the need for changes to the organizational structures that might be necessary for effective implementation of the integrated system; and (5) to determine priorities for implementation of the various system components.

From interviews that were conducted with students, faculty and library staff, it was concluded that there were three functional areas from which the system design should grow: processing control, bibliographic control and access, and collection control. These are defined more fully in section V below.

II. CURRENT LOCAL ENVIRONMENT

The Duke University Libraries are administratively divided into three systems: the Medical Center Library, the School of Law Library, and the Perkins Library system, which is the largest and is composed of the William R. Perkins Library and its nine branches. The collections of the three

systems total more than 3,000,000 volumes and the union catalog in Perkins alone holds over eight million cards, with 6,650 added each week. The circulation count of all the libraries nears 393,000 items each year, plus 17,700 interlibrary loan transactions.

Computer technology is used at present to help order, process and retrieve materials. The Technical Services Data Base (TSDB) is used as an acquisitions/in-process file to procure and track the progress of material. In 1980, plans were announced for the Medical and Law School libraries to join Perkins in using this system and for the system to be made available at public service points.

Access to serials holdings is provided via computer output microform (COM) catalogs, with brief bibliographic information and summary holdings for cataloged serials in Perkins and Law in one list, and a separate list for the Medical Center Library.

In late 1978, the Perkins and Law Libraries began to use the Online Computer Library Center (OCLC) system for online cataloging via a membership in the Southeastern Library Network (SOLINET).

The Triangle Research Libraries Network (TRLN) is a cooperative relationship among the three research libraries in the Triangle area: Duke, the University of North Carolina at Chapel Hill (UNC-CH), and North Carolina State University (NCSU). Through continuing funding provided by a Higher Education Act Title II-C grant, work has begun on the development of a computer and telecommunications-based bibliographic system to link the three institutions. This system is explained further in section III below.

A particular frustration for the Duke libraries has been the unacceptable performance by the Triangle Universities Computation Center (TUCC), which supports the TSDB. Downtime has been of unprecendented length, and response time has been poor. This performance led to the identification of high availability and reliability as requirements for a future system.

Through the interviews conducted by the Team, six issues and concerns were identified concerning the present systems: (1) the lack of unified records produces an unwieldy system in which it is difficult or impossible to update information consistently, to track material, and to produce necessary outputs; (2) the use of many manual files has created labor intensive operations and much data redundancy; (3) access to present automated systems is inadequate and when provided, systems are often unreliable and inadequate to meet our needs; (4) cooperation among departments and libraries, and with other organizations, is difficult because of logistical problems such as access to data; (5) current documentation of procedures and systems is not available, thus creating problems of usability of the library for patrons and staff; (6) there are unrealistic expectations of what automated systems can, will, and should do.

III. NETWORK ENVIRONMENT

The current network environment can be characterized as unstable. At present, SOLINET does not directly provide computerized services, but acts as a broker of OCLC services. In the near future, OCLC and SOLINET may enter into a joint venture to provide shared automated services, but the effect of these plans on local planning is questionable.

SOLINET, using the Washington Library Network (WLN) software, originally planned to develop a regional support system for the updating of local libraries OCLC-MARC Subscription Service (archive) tapes of cataloging records. Recently this concept has changed from catalog maintenance to providing a "reference subsystem." The effect of this decision is as yet undetermined. SOLINET has also announced increases in their charges.

The TRLN project is based on a report of two consultants, John Knapp and Ritvars Bregzis, "that a computer and telecommunications-based bibliographic system should be established in each of the Triangle University Libraries as the core of a bibliographic access network...[to] consist of three minicomputer sytems, one located at each library, linked by telecommunications facilities, using identical operating systems and telecommunications software, and compatible applications software." The project has been funded under the HEA Title II-C program and recently it was announced that the grant has been renewed for one year, with good prospects for funding to complete the three year project goals.

Since the TRLN project began, the following has already been accomplished: (1) compatible standards for representing monographic holdings have been adopted by all three institutions; (2) an archive tape processing system has been put into effect, providing a means to merge archive tapes into separate master databases for each institution, and computer validation of records to ensure data consistency; (3) a COM catalog has been produced for all three institutions; (4) the specifications have been completed and operation should begin late this fall of an online system for update and maintenance of archive tapes. The archive tapes will be the basis for the online catalog.

Involvement of Duke staff in the ongoing development of the project has been high, and there has been no issue to date that has not met with consensus.

Future plans for the TRLN project include: (1) in the next grant year (October, 1981-October, 1982) the design of the bibliographic and holdings modules will be completed and maintenance of these will be operational. Access to records via record key (e.g., OCLC record number) and other standard access methods will be designed; (2) by the end of the 1983 period, maintenance of the authority module will be implemented and links between authority and bibliographic modules established, and standard access methods (author, title, subject, call number, i.e., similar to the traditional card catalog access) will be in operation; (3) the third year (1984) will bring completion of the bibliographic access project, with the availability of sophisticated search strategies such as Boolean (and/or, not) operators and keyword searches, as well as instructional programs and system prompts.

The primary impetus for TRLN was the recognized need to avoid redundant development of in-depth research collections. Detailed coordination of collection development relies on full bibliographic access to each collection. While it may be faster or easier to develop a bibliographic control and access system at Duke, it seems unlikely that any local effort could be completed at this time faster then TRLN. Even if faster, considering the funding by HEA Title II-C, local development would be more expensive to the university. Given the high level of satisfaction in the Duke Libraries with cooperative ventures in the past, it would be unfortunate if that cooperation were not continued through Duke's participation as a full partner in the TRLN project.

It is recommended that the core of the integrated library system at Duke be the TRLN bibliographic control system and that the processing control and collection control functions be implemented so they are fully, efficiently and effectively compatible with all aspects of the TRLN system. The possibility of joint TRLN development of the other system components should be explored.

IV. CHARACTERISTICS OF THE DESIRED SYSTEM

A computer system should help increase the speed, accuracy, and productivity of library staff, and provide relief from most of the repetitive, labor intensive operations.

Hardware related characteristics include online terminals, with the capability to support at least 200 terminals. Since the environment dictates more online tranactions than batch, and more transactions for search and display than for maintenance of data, there must be good response time (average of three seconds, and a maximum of six seconds). Entensive data storage and processing capacities are required as well as expansion capability without major hardware replacement. The hardware must be extremely reliable (no more than two percent failure) and there must be backup systems (either hardware or output supplied). The system must be available during all hours of the libraries' operations, and dial access must be accommodated.

Software related characteristics include basing the system on the full MAchine Readable Cataloging (MARC) standard format for bibliographic and authority records and other standards where available. The system must be integrated, with all functions sharing a central database of bibliographic, processing and holdings information and access to accounting, requestor, supplier and borrower information.

The system should increase accuracy and timeliness of information and eliminate redundant maintenance of files. It must include the ability to produce forms, labels and management reports on demand. The system should allow only one person at a time to update a particular record and have the capability to perform format recognition and automatic validation of records. Date security must be provided, including the generation of machine readable daily logs (transaction audits), authorization for creation and maintenance of data, and monitoring of terminals to prevent unauthorized users from performing restricted transactions.

The system should be flexible, capable of modification and expansion without major system redesign, and should require minimal programming maintenance.

The system should have powerful search capabilities, such as keyword and Boolean operators. There should be direct user access to information on the availability of items from time of order through circulation, and the system must be easily employed by users with varying levels of expertise. This requires self-tutorial modules, system prompts, and system translation of encoded data into text before displaying on screens and reports.

The system must be capable of interfacing with other automated systems, whether local, regional or national, including the university accounting system, the In-School system, faculty and staff payroll files, the Bursar files, the TRLN bibliographic control and access system, and SOLINET and OCLC.

V. SYSTEM DESIGN

The system is comprised of three subsystems: processing control, bibliographic control and access, and collection control. The system is designed according to the functions to be performed and not according to departments in the libraries.

The structure and content of the various databases and files in the system will be determined ultimately by the type of database management system selected. Since the selection of a management system will not be accomplished until the make-or-buy decision that follows this study, ATT did not identify the databases or files. Instead, data elements were organized into logical categories and interrelationships of data elements were noted. These data categories include information in the following areas: bibliographic, holdings, processing, requestor, supplier, fund, system control, authority control, charge-out/return, recall/hold, reserve, borrower, and interlibrary transactions.

Processing Control consists of all functions related to the procurement and control of library materials prior to full cataloging. The system must handle all types and formats of materials (e.g., books, journals, non-book publications, etc.).

When a full bibliographic/authority/holdings record has been created through the bibliographic control function, the processing record will be purged. For materials that never receive full cataloging (e.g., government documents), the minimal bibliographic information in the processing record will become the permanent record in the system.

Bibliographic Control and Access provides a mechanism for the creation and maintenance of, and access to, bibliographic and holdings information. Three component records are generated through this function: bibliographic, authority, and holdings.

The bibliographic record includes a description of the work, analysis of the subject content, and access points to the work (such as the author, title, or subject headings).

The access points for the fully processed records have the heading forms controlled through an authority file. The authority file ensures that each heading is entered into the system in a uniform manner, and that alternative forms of the headings are given as references to the correct form.

Holdings records include piece specific information concerning the work: library location, call number, copy and volume numbers of each physical piece, piece specific notes and special features information, and machine readable identification number (e.g., bar code).

The access and reporting function provides a method for retrieving fully cataloged records (if available) or processing records (if fully cataloged records are not available). Access will be provided using a variety of entry points, including author, title, series, subject, and keyword searching. Output, such as specialized bibliographies or statistical reports, could be provided either online or batch.

Collection Control includes two major subfunctional areas: physical control, and the handling of interlibrary transactions. Physical control is a means for keeping track of fully processed material that is not in its permanent location (e.g., material is out on loan or is lost or missing). Interlibrary transactions includes a mechanism to receive and verify requests for materials from Duke users and from other libraries, and electronic transmission of procurement and lending transactions.

VI. IMPLEMENTATION

The ATT charge did not allow for a review of automated library systems and packages now available. While the estimates for costs were based on development and implementation at Duke, this report does not endorse or reject any set of techniques or any specific hardware. It does stress and recommend in the strongest terms that whatever software and hardware is selected, the highest consideration be given to the needs of the Duke libraries, local participation in TRLN, and Duke's dependence on national utilities such as OCLC.

The team developed an implementation strategy that took into consideration the logical requirements of building interdependent parts of the system, the early direct benefits to library users, and the present circumstances of the current local environment. The team recommends that the processing control and collection control subsystems be implemented together in two phases over a 24 month period. Section VI of the full report describes the tasks to be accomplished in each phase. The bibliographic control and access subsystem is to be developed through the TRLN project. This would be done concurrently with the development of processing and collection control. The schedule for TRLN development is outlined in Section III of the report.

There are problems that delaying implementation would exacerbate. Obviously, the maintenance of a labor intensive operation, fraught with duplicative efforts, would continue during the delay period. Of greater concern is the status of the present systems. The TSDB cannot perform many of the necessary functions that have been identified, such as automatic claiming, sorting of orders by vendor, producing management reports on

demand, or allowing for efficient reordering of multiple copies. Further, the TSDB represents yesterday's technology. At present most systems are expected to have a lifespan of five to ten years; the limitations of the TSDB are amply illustrated by the use of fixed length fields for variable length data--a technique that no longer needs to be employed for efficient database management. Reprogramming to make the TSDB do more of the functions required by the library would not be cost effective considering the limitations inherent in the design.

Another cost of delay would be continued reliance on the services of TUCC, services that have proven ineffective for administrative data processing. Moving the TSDB from TUCC to DUCC would not meet library needs because the system itself has been judged inadequate.

Delay in implementation would bring no relief to areas that are in need, particularly serials control. Many operations would continue to be performed manually, if at all, and work would be highly redundant. This ultimately would be reflected in problems in collection development and management and in user services. Reliance on the existing manual circulation system would cause continuing problems for the user, such as the difficult process that must be used to check-out and renew books, and the manual generation of overdue notices.

VII. COST-BENEFIT ANALYSIS OF THE PROPOSED SYSTEM

The actual costs of the projected system are enumerated in full in the report (section VII). Since this information is in tabular form and is not amenable to summarization, no precise cost figures are included here.

Three kinds of costs were calculated: development, operating and equipment costs. Development costs for the processing and collection control subsystems are more detailed for phase I than for phase II and include estimates for database design, documentation, and development of searching and training modules. Development costs for the bibliographic control and access subsystem reflect costs for in-house development. Should the TRLN project be used for the bibliographic component of Duke's library system, as recommended, development costs would be replaced by the as yet unknown costs of developing an interface.

Operating costs were derived by multiplying the number of current transactions times $0.10 per transaction (DUCC costs). Should the library lease or purchase a library-based computer, these transaction costs would be replaced by hardware costs. Operating costs for DULIS will rise when the entire system is operational (including bibliographic control and access) since this is when the public will make fullest use of the system.

Equipment and equipment costs were based on an estimate of the number of new terminals, printers and control units needed in addition to those already in the library. Because of the fully interactive nature of the system and high staff reliance upon it, terminals were projected on the basis of one terminal for every two technical processing staff members, two terminals for every branch library, and, using a common library rule of thumb, one terminal for every one hundred public users. Costs are based on current IBM leasing

rates. It is estimated that 10% of the total system costs would be distributed to the School of Law Library and 15% to the Medical Center Library.

Benefits derived from such a system were separated into two categories: dollar benefits and intangibles. Dollar benefits were calculated by dividing the total number of task transactions per year in each functional area by the rate of transactions per hour. This was multiplied by the average salary per hour (including benefits, but without inflation). Tasks that were not necessary under the automated system, or which would be accomplished more quickly, were omitted or adjusted.

There are eight additional benefits that were not quantified but that nevertheless result in direct benefit to the University. These intangible benefits are (1) union access to bibliographic data in all campus libraries for library staff and users, including access to materials on-order, in-process, or in circulation; (2) shared collection development among campus libraries and among Triangle libraries would be enhanced due to better access to information; (3) improved quality of data in that it would be more timely, accurate, and secure; (4) more effective use of University resources, such as electronic interfacing with other University systems (accounting, student tracking, etc.); (5) improved service to public users provided by union access to bibliographic data from non-library building locations, more information concerning the location and status of items, more flexible search capabilities, and improved quality of data; (6) improved management data and reporting, leading to better planning and budgetary control; (7) a more understandable system, easier to use, with self-instruction modules and comprehensive documentation; and (8) improved image of the University and the libraries by meeting library service expectations of prospective students, faculty, and staff.

RECOMMENDATIONS

A. Participation and Funding

1. All Duke libraries should participate in the development and use of the system, and should accept standardized data control.

2. The project should be budgeted as a whole. The full benefits will accrue from an integrated system only if the entire system is operational. The "stand-alone" system approach that is reflected in the existing library systems at Duke leads to redundant data and requires labor intensive operations to manipulate incompatible automated systems.

B. Management of Implementation

1. The library administrations should establish a library automation committee composed of staff from the Perkins, Law and Medical libraries. With the approval of the library administrations, this committee should:

   (a) make decisions concerning the policies, practices, and organizational matters related to library automation projects

   (b) coordinate activities of the project's data processing implementation team (explained in further detail below)

   (c) coordinate the various Duke-related activities of the TRLN project.

   Members of the committee should have in-depth knowledge of a library operation and of automated systems, as well as general knowledge of the library organization. For the sake of continuity and familiarity with this system design, members of the current ATT study team should initially serve on the automation committee, with the length of service and other membership to be determined by the libraries' administrations.

2. An implementation team should be established as soon as possible. This implementation team should be chaired by a project manager who would report to the library automation committee. The membership of the team should consist of the appropriate data processing staff and of various library staff members (2-5) to represent the library functions being implemented. The library staff representatives may change as the functions to be implemented change.

C. Implementation Plan - General

1. The implementation of the system should take place in phases (as described in the full report) and the system functions should be

implemented in the sequence identified in the report (unless otherwise indicated after the alternative methods of implementation, as described below, have been investigated.)

2. An evaluation of alternative methods of implementation, particularly concerning processing and collection control, should be undertaken. This evaluation must include all requirements enumerated in this study, particularly in terms of the recommendations in item D below. The study must also include an assessment of dedicated library hardware versus utilization of a campus computing facility. Members of the present ATT study team should be involved in this evaluation for purposes of continuity and because of their familiarity with the requirements of the library system.

D. Implementation Plan - Bibliographic Control and Access and TRLN

1. The bibliographic control and access system being developed by TRLN should be used as the bibliographic component of the Duke library system. All other system development (described in item E below) must be fully and economically compatible with the TRLN system in terms of hardware, software, and operational and database management systems.

2. Cooperative development of the processing and collection control subsystems should be investigated with the other TRLN members to help ensure maximum compatibility of those subsystems with the bibliographic control and access system.

E. Implementation Plan - Processing Control and Collection Control

1. The implementation of the processing and collection control subsystems should be done using the most current and cost effective data processing technology available (e.g., use of database management techniques.)

2. An evaluation should be made of techniques currently available for capturing OCLC record data online to load into a local system. Data capture should occur as early as possible in the process.

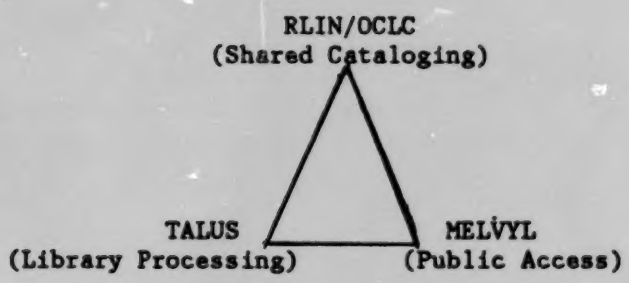
F. Training

1. The personnel hired to implement the system should either have knowledge of or be trained in the technical specifications, computer languages and the database management system to be employed before embarking on the project.

2. Adequate initial and continuing training should be provided in the use of the system once it is available.

GENERAL SYSTEM DESCRIPTIONS AND REVIEWS

AUTOMATION OVERVIEW



23

The Goal

Automated systems in the UC Berkeley Library have evolved to a point where both library patrons and processing staff are involved in their use. Patron use of automated systems to access Library holdings is increasing. Processing staff provide the records for public access through almost exclusive reliance on automated procedures. The interface of all automated components must be carefully designed to create an integrated library system. The current goal of automation planning is to create a processing flow that links Berkeley's use of three major computerized components. These components are:

1) RLIN/OCLC (bibliographic utilities) for use as a source of fully cataloged records in the LC MARC formats
2) MELVYL for use as the University-wide on-line catalog for public service access
3) TALUS for use as the Library processing system

RLIN/OCLC

The cataloging utilities (RLIN/OCLC) are a source of shared cataloging copy. Neither MELVYL nor TALUS has this resource feature at present so the use of RLIN/OCLC will continue. Machine-readable cataloging records will continue to be received from these bibliographic utilities and will be added to our local databases for public access (MELVYL) and library processing (TALUS).

MELVYL

MELVYL, the on-line catalog for the nine University campuses, displays bibliographic records created on RLIN/OCLC and local campus systems. Currently, only a prototype version of the MELVYL system is available. This prototype contains randomly selected, fully cataloged campus records from RLIN/OCLC in the MARC Books format. MELVYL, which is under development by staff at the System-wide Division of Library Automation (DLA), will include all the machine-readable Books records the campuses have created, but records now in the prototype database are static. Any maintenance that may have been done to any of the prototype records by the owning campus is not reflected in the MELVYL database. When the DLA "updateable database" is available, changes made to records will be sent to DLA along with new campus records and loaded into the MELVYL database on a regular basis.

Eventually, MELVYL will include the other MARC formats. Work is currently underway to investigate loading the CALLS (California

Academic Libraries List of Serials) database. CALLS records are brief and do not contain much of the information called for in the MARC Serials Format, but the load of this database will provide on-line access to University serials holdings using a modified version of the MELVYL search capabilities. Work on the other MARC formats (Maps, Music, and Films) will follow.

TALUS

TALUS, the Berkeley Library processing system, will be used to maintain the records cataloged on RLIN/OCLC and displayed in MELVYL. TALUS will complement, not duplicate, the MELVYL on-line catalog by providing staff with on-line management of machine readable records.

A Tandem computer and terminals will be used to run and access TALUS. The main computers are now housed at University Hall in the Systemwide Division of Library Automation (DLA). The Tandem terminals used to access the system will be located initially in central technical processing areas. Microfiche catalogs will continue to be produced for public service and central processing access. It will be possible to access both the MELVYL and TALUS databases from a single, TALUS terminal.

TALUS will be phased into production in the following stages:

- Phase I: Query and Maintenance -- maintenance of bibliographic fields (including call numbers and holdings) only, not processing fields such as vendor or fund. The Datapoint will still be used for acquisitions work. TALUS tapes will be interfaced with the current local database. The TALUS tapes will look like another RLIN/OCLC-type bibliographic utility to the local system.
- Phase II: Acquisitions Processing -- Books and Serials (all library materials) (including fund accounting). The Datapoint will be gone.
- Phase III: Inventory Control
- Phase IV: Serials Processing -- check-in, claiming and binding information

THE TALUS DATABASE

TALUS will contain bibliographic records stored in the standard MARC formats for Books, Serials and Maps. The possibility of loading records in the Scores, Sound Recordings and Films (Audio/Visual) formats is being investigated. The TALUS database will store MARC tags without renaming them to UCB local values and will retain indicators and delimiters. In other words, we will use the standard MARC formats rather than the modified MARC used in the Datapoint-based system. This feature will make processing work a great deal

more consistent. Records that are now in the local database will be loaded into TALUS. The current local database includes fully cataloged records from RLIN/OCLC and all TCP, local cataloging, and in process/on order records keyed on the Datapoint. Local database records are in the Books, Serials and Maps formats. The loading of our current database into TALUS is complicated by two factors that involve local keying practices as well as the programs used to interface RLIN/OCLC records:

1) Standard MARC tags are not used in the current local database. Tags have been used that do not exist or are used for other purposes in the standard MARC format. A program is now being written that will translate these local tag names to their standard counterparts.

2) The local system does not store subfield delimiters. For most tags there is no way that these can be added or replaced through programming because cataloging practices have varied so much over the years. Archival RLIN/OCLC tapes will be used, when possible, to correct this problem, but the majority of uncataloged records will not contain subfielding after the TALUS load.

After all existing Berkeley bibliographic records have been loaded into TALUS, new RLIN/OCLC tapes will be interfaced directly into the TALUS database. TALUS tapes will then be used to supply the cataloging information used in the production of the microfiche catalogs (CAT 2).

The CU Authority File (CUAF) will continue to be keyed and maintained on the Datapoint. It is not yet clear how authority control will be handled in TALUS. The Headings File (discussed below) will be used initially for this purpose. In part, decisions about authority control in TALUS will be based on developments in MELVYL. If DLA is able to load the full LC MARC authority tapes into MELVYL, TALUS will probably link to that information. If MELVYL will not contain the LC authority tapes and the records in the CUAF, then TALUS will need to include an authority control system.

TALUS -- PHASE I: QUERY AND MAINTENANCE

For Phase I, records will be loaded into TALUS in three batches. The projected order is:

1. OCLC records
2. TCP, TACS, local cataloging records
3. RLIN records

OCLC was chosen for the first loading because maintenance of OCLC records must be done locally; the OCLC system does not support maintenance of records in its database. TCP, TACS, and local catalog records must also be locally maintained. RLIN records will be loaded last if RLIN maintenance is available. This order may change depending on the performance of the RLIN system.

During Phase I, LC MARC bibliographic fields (including call numbers and holdings) will be maintained on TALUS, and our local processing fields will be maintained on the Datapoint. When Phase I has been completed and the Acquisitions Processing functions of Phase II are available, maintenance on all types of on-line records will be done on TALUS. When Phase II is in operation, a single Newsys record will include bibliographic and holdings information as well as in process and on order information.

SYSTEM OVERVIEW
FILE DESIGN

TALUS stores information in four files. The separate file structure is invisible to the TALUS terminal operator.

1. HEADINGS FILE
2. BIBFILE
3. HOLDINGS FILE
4. ASSOCIATED INDEXES

1. The HEADINGS FILE stores all personal, corporate/conference, uniform title, topical subject, and geographical subject headings that are found in bibliographic records. If we decide that the future authority file belongs in TALUS rather than MELVYL, authority records will replace records in the HEADINGS FILE. The HEADINGS FILE is interactive and headings records are accessible for modification. All bibliographic records that use a particular heading will be linked to the appropriate heading record. When the HEADINGS FILE record is modified, the system will automatically change headings in all linked bibliographic records. Thus, bibliographic changes that must now be keyed repeatedly for each occurrence of a heading will, on TALUS, need to be keyed only once. To link headings, TALUS stores the bibliographic, Tandem-assigned record numbers in the HEADINGS FILE and the corresponding HEADINGS FILE numbers for each heading in the bibliographic record.

2. Bibliographic records are stored with full MARC tagging in the BIBFILE. The headings for these records are also stored in the HEADINGS file. The links between the BIBFILE and the HEADINGS file are automatically created when the record is input or loaded into TALUS as described above.

3. Holdings (call number, location(s), summary and/or detailed holdings, etc.) are stored in the HOLDINGS file.

4. The ASSOCIATED INDEXES sort and normalize information for storage. These indexes are the avenues through which TALUS accesses the information stored in its database. Information is added to the ASSOCIATED INDEXES automatically as each bibliographic record enters the TALUS database. Each index stores only specific portions of the bibliographic record (for example, the call number index stores only the call number from a record along with the TALUS record number link back to the bibliographic record to which it belongs). When

searches are performed on TALUS, it is the ASSOCIATED INDEXES that are actually being searched. The summary screen that results from a TALUS search is a display of the normalized ASSOCIATED INDEX for that file. For example, a title summary screen results from a title search and displays the normalized title stored in the ASSOCIATED TITLE INDEX. After the appropriate bibliographic record is found on the summary screen, that record can then be displayed in a detailed, unnormalized screen. It is this detailed display that reflects the actual storage of bibliographic fields on TALUS. Only the ASSOCIATED INDEXES are built with normalized information.

Each search on TALUS accesses its own associated index and results in a different display. Searches and ASSOCIATED INDEXES are:

**Title
**Call Number
**Record Number
RLIN - OCLC - UCB (Datapoint) - LCCN - ISSN - ISBN - Tandem
**Headings
Personal Name
Corporate/Conference Name
Uniform Title
Topical Subject
Geographical Subject

Normalization is the process by which the TALUS system standardizes bibliographic information for index storage and retrieval. Only the Associated Index files store information in the normalized form. The actual fields as input are stored in the HEADINGS FILE, BIBFILE and HOLDINGS FILE as input without being normalized. Although it varies somewhat from index to index, normalization involves:

**Converting all alphabetic characters to upper case
**Removing initial articles
**Changing punctuation, diacritics and some special characters to blanks
**Collapsing multiple blanks to a single blank

The special characters that are translated rather than changed are:

Polish L/l
Turkish i
Digraphs AE/ae and OE/oe
Swedish crossed O/o
Hooked O/o and U/u
Icelandic Thorn (upper/lower) -- translated to TH/th
Eth -- translated to th
Script l

The following searches will initially be available on TALUS:

1. The TITLE search index accepts searches up to 50 characters in length. Title searches must begin with the first word of the title that is not an article. If only the first portion of the title is known, the user inputs what is known. The system assumes that all searches have been truncated and expands each one automatically. Title summary screens display normalized titles with up to ten records listed on a single title summary screen. If more than ten records are retrieved the keyer then scrolls forward through the undisplayed

records. Once the keyer proceeds from the first title summary screen, it is also possible to scroll backwards through a limited number of titles already displayed. It will be possible to specifiy the MARC format (i.e. Books, Serials, Maps, etc.) in conjunction with the title search. The title summary screen display includes the the publication date and the normalized title.

2. CALL NUMBER searches are up to 100 characters in length. The call number is also normalized for retrieval and display. For call number normalization all prefixes (f, ff, t, etc.) are stripped. Normalized call numbers display on a call number summary screen. A reversed scrolling function.is available. When the call number search result is first displayed the keyer may scroll back through screens that list call numbers falling before the one used as a search key.

3. A RECORD NUMBER search is done using any of the numbers listed above. Because this search is record-specific it retrieves only a single record and displays it in a "detailed format". The detailed display includes the full MARC record in combination with local call numbers, RLIN/OCLC/Datapoint numbers, and any local notes. Although the headings, all numbers and holdings are actually stored in separate files, all fields are combined in the detailed display and the fact of separate storage is not apparent to the user.

4. The HEADING search differs from the searches discussed so far because of the way in which the ASSOCIATED HEADING INDEX is built. In this index, headings are stored only once, regardless of the number of bibliographic records in which they are used. Once a record for a particular heading exists in the HEADINGS file, each subsequent use of the heading in a bibliographic record is automatically linked to that Heading record.

Heading searches are 30 characters long and must begin with the first word of the heading. The system assumes that all searches have been truncated and expands each one automatically so that every heading that begins with the search key used is retrieved. The Heading summary display lists normalized headings that match the search key, and like the title summary display, limited backwards scrolling functions are available.

When the correct heading is located in the summary display it is then possible to instruct TALUS to display all the titles that are linked to that heading (remember that each heading is stored only once although it may have been used in conjunction with many titles). It will be possible to specify that titles are wanted that use the heading as an author, series, subject, or any entry. The summary title display that results from a heading search is much the same as the summary display that results from a title search. However, when accessed by heading, titles are not normalized for display and, thus, the summary screen includes characters that are translated or stripped out by the normalization process.

VIRGINIA POLYTECHNIC INSTITUTE

AND STATE UNIVERSITY

Center for Library Automation
416 Newman Library
Virginia Tech
Blacksburg, VA 24061
(703) 961-5847

VIRGINIA TECH LIBRARY SYSTEM

BRIEF SUMMARY

Virginia Tech Library System (VTLS) is designed to be an online, comprehensive, and integrated library system. VTLS not only automates the traditional library services, but also replaces the card catalog and most other manual data files.

The system has been operational since 1976 and is presently installed in several locations in the United States and abroad. The salient features of the latest release of the system are the following:

* Ability to handle full MARC records. Data entry is possible by (a) direct entry, (b) MARC tape transfer, and (c) OCLC interface module which permits direct transfer of data from OCLC terminals to VTLS.

* Full online capability to retrieve and modify all data. Retrieval is through all title fields, all author fields, all subject fields, all added entries, call numbers, barcode or OCR label numbers, and bibliographic control numbers such as OCLC number, ISSN, ISBN, and LC card number. Access to author/title mixed fields is by both author and title subfields. Furthermore, the system allows for retrieval by partial call number.

* A comprehensive circulation control module, which is well integrated with data entry and searching.

* Ability to store, retrieve, and edit serials holdings records. The system also permits multiple bibliographic records to be associated with the same call number; this is of significant importance to serials management.

* Ability to make global changes to author and subject entries. This means that corrections to a single authority record are automatically reflected in all of its associated bibliographic records.

* Ability to support multiple libraries with one or more computers. VTLS provides library networking features which allow access to and manipulation of local and remote files.

* Human-engineered system design which is based on the concept of screen networking. The system is easy for novices to understand and use, and it contains features that save time for professionals.

* Easy to read screens. The data retrieved through numerous access points is logically sorted wherever appropriate, and the full ALA character set is properly displayed.

The complete system documentation is available to systems users. The following features are presently under development:

* Coded Holdings
* Serials Receiving and Claiming
* Acquisitions and Fund Accounting
* Management Reports
* Comprehensive (MARC-Based) Authority Control
* Reserve Reading Room Control

The software is available from Virginia Polytechnic Institute and State University at a cost of $40,000, plus a maintenance fee of $250.00 per month. For full details, contact the Library Automation Project Office.

INSTALLATION POLICY

FOR

VIRGINIA TECH LIBRARY SYSTEM

(VTLS)

A. SYSTEM INSTALLATION CONSISTS OF THE FOLLOWING:

1. Installation of VTLS software.

2. Determination and entry of institution-specific options.

3. Training:

   (a) General systems usage (2 hours)

   (b) Circulation (multiple 1 hour sessions)

   (c) Data control (2 hours)

   (d) Systems operations (2 hours)

   (e) System manager (3 hours).

Our system in very easy to use. Experience shows that this training schedule is sufficient. Additional training may be contracted for.

B. PRE-INSTALLATION CHECKLIST:

The user must insure that the following items are available prior to installation.

1. Hardware:

   All hardware must be completely installed and fully operational.

2. HP System Software:

   The required HP software consists of MPE/3000, COBOL II, IMAGE, KSAM, SPL, and QUERY.

3. Machine-Readable Data:

   If the user has machine-readable data that is to be preloaded into the system, then that data must be available in the agreed upon format and be error free. Should such machine-readable data require special

handling, then Virginia Tech software engineers may be required to make a special site visit under mutually agreed terms.

4. Individuals who are to receive training must be available during the installation period. Those who are to receive system operation and system manager training should be available for two full days.

C. COSTS AND SCHEDULES:

Installation normally takes three days. Additional days may be scheduled as required, subject to mutual agreement. Installation services are free; except for travel costs, so long as the normal installation schedule is followed. Travel costs (transportation to and from Blacksburg, Virginia, plus hotel and meals) for no more than three individuals must be borne by the user.

MAINTENANCE POLICY

FOR

VIRGINIA TECH LIBRARY SYSTEM

(VTLS)

1. Software Maintenance Consists of Two Items:

   (a) Enhanced releases of the software.

   (b) Correction of any errors in the software. Data errors, caused by any reason, are the responsibility of the user.

2. New Releases:

   (a) As they become available, new releases will be provided to those users who have been on a maintenance contract continuously.

   (b) New releases will be sent on tape to the user. The user should install these new releases as soon as possible.

   (c) It is the responsibility of the user to provide the necessary operating system and the compilers required for the software.

3. Error Corrections:

   (a) Errors in the software will be corrected as soon as possible after they are brought to the attention of Virginia Tech.

   (b) The user must provide sufficient documentation for Virginia Tech to be able to re-create the error on the latest release of the software. Errors that cannot be re-created on the latest release will be assumed to have been fixed in the latest release which should be installed by the user.

   (c) The user must provide a 1200 baud dialup port to enable Virginia Tech software engineers to access the user's system for problem resolution. Virginia Tech shall take all necessary steps to insure that none of the information or programs, in any form, acquired from user through access to the user's system are made available to any other person, institution, or corporation. It will be the responsibility of Virginia Tech to reasonably insure that all individuals having access to such information or programs on behalf of Virginia Tech shall likewise observe this non-disclosure Agreement.

4. Costs:

The maintenance costs for the software are $250 per month, payable in advance. Renewal of the maintenance will be at the then-current prices.

5. Discontinuation of Maintenance:

(a) Should user decide to discontinue maintenance for any reason, software support, problem resolution, and receipt of system enhancements will be discontinued.

(b) user still will be required to pay a usage charge of $35.00 per month, payable annually in advance.

(c) Maintenance may be restored by paying either 1) the back payments from the time of cancellation or 2) maintenance charges for twenty-four (24) months, whichever is less. Upon such restoration of maintenance, user is then entitled to all system enhancements which have occurred during any period of discontinuance.

35

VIRGINIA TECH LIBRARY AUTOMATION PROJECT
416 Newman Library
Blacksburg, Virginia 24061
(703) 961-5847

VTLS INFORMATION FORM
(Revised March, 1982)

The information contained on the reverse side of this form will be used to assess the computer configuration required to adequately support your library's automation needs. The following instructions correspond to the question numbers on the other side of this form. For all questions, please give your best estimates for both the present status and the projected status in two years.

1. TITLES: This refers to the number of unique bibliographic records in your collection.

2. ITEMS: This refers to the number of volumes (physical pieces) in your library.

3. FULL MARC RECORDS: This refers to the number of full MARC records that you have in machine readable form.

4. NON-MARC RECORDS: This refers to the number of bibliographic non-MARC records or abbreviated MARC records that are in machine readable form. If you have such records, please provide the record layout on a separate sheet.

5. ITEM RECORDS: This refers to the number of item records that exist in machine readable form.

6. PATRONS: This refers to the number of library cards issued. It is not necessary to give information by branch.

7. HOLDINGS RECORDS: This refers to records which the library wishes to express in ranges (serials, documents, etc.).

8. MAXIMUM CIRCULATION: This number represents the maximum number of items that will be in circulation at any one time. Please provide best estimate.

9. CIRCULATION ACTIVITY: This refers to the number of circulations per year by branch.

The rest of the questions are self-explanatory.

	PRESENT	PROJECTED IN 2 YRS.
1. Titles	_____	_____
2. Items	_____	_____
3. Full MARC Records	_____	_____
4. Non-MARC Records	_____	_____
5. Item Records	_____	_____
6. Patrons	_____	_____
7. Holdings Records	_____	_____
8. Maximum Circulation	_____	_____
9. Circulation Activity	_____	_____
10. Yearly Attendance	_____	_____
11. Number of Branches	_____	_____

12. Will the system be used to totally replace the catalog? Yes No

13. Will the system be used to compliment a "closed" catalog? Yes No

14. Do you plan to use an existing HP-3000 system? If so, please provide the hardware/software configuration of the machine on a separate sheet.

15. Please indicate the source/method used for creating bibliographic records. (Circle all that apply)

a.	From OCLC terminals	Yes	No
b.	From LC MARC tapes	Yes	No
c.	From OCLC archive tapes	Yes	No
d.	From MARCIVE tapes	Yes	No
e.	From SCIENCE PRESS tapes	Yes	No
f.	From BLACKWELL N.A. tapes	Yes	No
g.	From AUTO-GRAPHICS tapes	Yes	No
h.	Direct entry	Yes	No
i.	Other	Yes	No
	(If yes, please specify)		

16. Institution Name: _____

Address: _____

Contact Person: _____

Title: _____

Telephone: _____

Library Automation Project
416 Newman Library
Virginia Tech
Blacksburg, VA 24061
(703) 961-5847

LIBRARY POLICY INFORMATION REQUEST
(Revised May 6, 1982)

The following is a list of parameters which will be set at the time of VTLS installation. Because they are dependent on local library policy, their values *must* be established prior to the arrival of VTLS personnel.

Patron Parameters

Define up to five (5) different classes of library patrons. (NOTE: The labels for the five possible patron classes are "FC", "ST", "OT", "GD", and "UG".) For *each* patron class defined, provide the following information:

1. Circulation period (in days).
2. Overdue fine (in cents per item per day).
3. Should the patron be blocked from circulation, if his fines exceed a given limit? If so, what is the limit (in dollars)?
4. The period of time (days from last update of record) after which the patron's record is deleted from the system, if he does not have any outstanding materials or fines.
5. The period of time (days after last update of record) after which the patron's record is deleted from the system regardless of outstanding materials or fines.
6. The number of times the patron may renew an item.

Item Parameters

Define up to 400 classes of items which have different circulation periods. For *each* item class, provide the following information:

1. Circulation period (in days).
2. Overdue fine (in cents per day).
3. The number of times the item may be renewed.

NOTE: For circulation period, the system uses the lesser of the values specified for the item and patron class of the particular circulation transaction. For both renewal limit and overdue fine, the system uses the larger of the values. An exception is made when the overdue fine is specified to be zero for that entire class of patrons. When this is the case, no fine is charged, regardless of the specification for the item class.

Fine/Grace Parameters

1. The number of grace days to be granted in the calculation of overdue fines.

2. The maximum fine to be charged a patron for a single overdue item.

Subject Access Parameter

Specify the values for the indicator of the MARC 6xx fields by the subject access desired.

Call Number Access Parameter

In cases of multiple call number entries within MARC records, specify the tag used locally.

Letter Control Parameters

1. The number of days between the due-date and the first overdue notice, and the number of days between the first and second overdue notices.

2. The number of days between the due-date and the overdue bill.

3. The minimum circulation period before which an item may be recalled by another patron.

4. The number of days allowed for the patron to receive the first recall letter in the mail. (When the due date is changed because of the recall, this mail delay will be considered in the calculation of the new date.)

5. The number of days between the first and second recall letters, and the number of days between the second and third recall letters.

Text of Letters

Please review the attached letters and note any desired changes. *Be aware that some of these letters are categorized by patron class.*

Other Defaults

1. The default circulation period to be used during data entry of items.

2. The initial entry default for city, state, and zip code within a patron's address.

3. The default item price to be used in printing overdue notices and bills.

STATE UNIVERSITY OF NEW YORK AT ALBANY

(SELECTED SECTIONS)

TASK FORCE ON AUTOMATION PLANNING FOR CIRCULATION

FINAL REPORT

Date Submitted: September 20, 1982

Task Force Members:

Carol Boduch
Meredith Butler, Liaison
Mary Cargill
Roger D. Gifford, Chair
Doreen Sponable
Peter Vonnegut

I

TABLE OF CONTENTS

		Page No.
I.	Introduction	1
	A. Charge	1
	B. Selection Of Systems To Be Investigated	1
	C. Methodology	3
	D. Literature Review	4
	E. Present University Libraries Circulation Services	6
II.	Criteria For Evaluation Of Circulation Systems	8
	A. Future Circulation Needs	10
	B. System Requirements	13
	1. Functions	14
	2. Data	54
	3. Report	58
	C. Capacity Requirements	61
III.	Evaluation Of Selected Systems	66
	A. LCS	67
	B. CLSI	71
	C. DataPhase	74
	D. GEAC	77
	E. OCLC	83

TABLE OF CONTENTS

		Page No.
IV.	Cost Study	85
	A. Maintain LCS On SUNY Central Administration Computer	86
	B. Enhance LCS On Minicomputer Located On Campus	86
	C. Replace LCS With Vendor-Supported Minicomputer-Based System	87
V.	Recommendations	91
VI.	References	94
	Appendices	96

I. Introduction

A. Charge

As specified in Appendix 1, the Task Force was charge with identifying the University Libraries circulation system requirements, comparing requirements with available automated systems including our Library Control System (LCS), and developing costs estimates:

1) To maintain LCS as it presently is,
2) to expand or enhance LCS, or
3) to develop or install a completely new automated system.

Because this study is only one part of the larger long-range planning effort to identify library automation requirements, the Task Force concentrated on defining circulation requirements in detail.

B. Selection of Systems to be Investigated

The Task Force examined circulation requirement specifications defined by other libraries, read recent reviews of existing circulation systems[1,11,14], surveyed the library literature, and selected four systems for closer examination.

The primary purpose for examining available circulation systems was to identify the variety of systems and options available, rather than to evaluate each system for selection. The system are changing so quickly that an in-depth evaluation should take place just before a system is selected.

The Task Force selected four systems for in-depth study:

1. OCLC's Total Library System (TLS) and Local Library System (LLS).
2. DataPhase's Automated Library Information System (ALIS).

B. Selection of Systems to be Investigated - Cont.

3. CLSI's LIB 100 System.

4. GEAC's Library system.

OCLC's Total Library System and Local Library System were selected as examples of circulation systems provided by a bibliographic utility, and because of the high probability that many SUNY/OCLC libraries will use one of the systems when they become available. The GEAC system was selected because several large academic libraries including several members of RLIN have it, and SUNY Buffalo has asked to acquire it. The DataPhase and CLSI systems were selected because they are systems which have been widely installed in public and academic libraries and have been in operation for more than five years in some libraries.[13]

The selection of these systems does not imply that these are the only available systems, and we must point out that by limiting our examination to these systems, we may have overlooked certain unique capabilities offered by other systems. These were selected for study because they appeared to represent the best automation options available to SUNY Albany at the present time.

It is important to note that we considered LCS to be an example of a circulation system developed or enhanced by a university library and therefore did not select another of this type for study. We did not examine a micro-computer based circulation system (e.g. Gaylord) because we did not find any such systems operating in large academic libraries.

V. Recommendations

1. The Task Force recommends that the University Libraries replace LCS with another automated circulation system:

   a. Maintaining the LCS software requires an on-going commitment of computing professionals. Using a vendor-maintained system could save two staff positions.

   b. Enhancing LCS software to have comparable capabilities with current turnkey systems would require many staff-years of programming.

   c. While LCS has served our circulation needs in the past, declining staff make it necessary to automate additional functions such as Reserve circulation in order to maintain current service levels.

   d. Since newer and more sophisticated circulation systems are now available, it is unlikely that other libraries would ever share LCS and its costs with us.

2. The Task Force recommends that the University Libraries purchase a "turnkey" circulation system that presently is in use in academic libraries of equal or greater size:

   a. The vendor would be contractually bound to provide a complete system at a fixed cost including installation, staff training, software maintenance, and enhancement, and hardware maintenance.

   b. The libraries could make a single "quantum" leap in system capabilities.

   c. Purchasing such system could be financed over five to ten years out of the money now budgeted for LCS. Inflationary increases would be limited to maintenance and communication charges.

Recommendations - Cont.

d. If the system is performing satisfactorily in other academic libraries of equal or greater size, the system is most likely to meet our circulation requirements.

e. A new system would improve the libraries' services, ability to be responsive to user needs, provide additional services not presently available which would reduce overdue fines collection and billing paperwork, and provide management information not presently available.

3. The Task Force recommends that online systems for circulation and the eventual online catalog be integrated:

a. Users of the online catalog need to know not only whether the library has an item but also whether the item is available.

b. Use of the circulation system for inventory control requires that bibliographic information in the circulation system be as accurate as possible, and identical to the information found in the catalog.

4. Regarding automatic input of unique item and patron numbers, the Task Force recommends the following:

a. That barcodes be used instead of OCR (optical character recognition).

Reasons:

i. Barcode light pens can be held at a greater variation of angles than OCR light pens.

ii. Barcodes are less susceptible to reader failure due to print defects.

iii. Barcodes are more difficult to plagiarize than OCR labels.

iv. Barcodes are in more common use in libraries.

Recommendations - Cont.

b. That the Libraries adopt the Monarch CODABAR format which has become a standard for library circulation systems.

Reason:

i. This will ensure compatibility with whatever library circulation system we obtain in the future.

c. That the Libraries begin to investigate a method of converting to barcodes and begin bar-coding new acquisitions as soon as possible.

Reason:

i. This will reduce conversion efford when the bar code readers are installed.

5. That priority be given to identifying and correcting errors in the bibliographic records used in the online circulation system.

a. Errors and inconsistencies in entry of bibliographic information result in erroneous ~~availability~~ information being given to patrons and staff.

b. According to a study of searching on the SUNY Albany LCS system[21], 10% of all bibliographic records contain errors that would prevent them from being retrieved, and 18% of all searches produce erroneous results because of errors in bibliographic data.

c. Unless these errors are corrected, they might be carried over into the future online catalog.

SPECIFICATIONS

MASTER RECORDS AND FUTURE SYSTEMS

FUNCTIONAL/SYSTEMS SPECIFICATIONS

EQUIPMENT AND SOFTWARE

SPECIFICATIONS

FOR AN

ON-LINE CIRCULATION SYSTEM

FOR THE

UNIVERSITY OF TENNESSEE, KNOXVILLE

LIBRARY

CONTENTS

		Page
I.	Introduction	1
II.	Instructions and Conditions to Bidders	5
	Submitting Quotation	5
	Vendor Background	6
	Vendor Financial Information	8
	Contract	8
	Terms and Conditions	9
	Equipment Transportation/Installation	11
	Performance Bond	13
	Non-Performance	13
	Liquidation of Damages	14
	Payment Schedule	15
	Benchmark Tests	15
	Acceptance Tests	15
III.	Operating Environment and System Configuration	16
	Introduction	16
	Schedule	16
	Project Coordinator	17
	Data Base Size	17
	Interactive Workload	18
	Hardware	20
	Software	27
	Vendor Support	28
IV.	Functional Specifications	34
	General Requirements	34
	Item Files	36
	User Files	40
	Circulation Functions	42
	Charge/Discharge/Renewal	42
	Holds	45
	Overdue/Fines	46
	Patron Blocking	48
	User Validation	50
	Query	51
	Security of Data Files	52
	Reports/Notices	53
	Inventory	58
	Reserve Book Room	59
	Networking	61
V.	Master Bibliographic Record	62
	Source and General Characteristics	62
	Authority Control	66
VI.	Future/Additional Modules	69

50

CONTENTS (contd)

		Page
VII.	Acceptance Test	70
	Downtime Coefficient	74
	Appendix A Glossary	78
	Appendix B OCLC Archival Tapes	84

V. MASTER BIBLIOGRAPHIC RECORD (MBR)

5.0 The core of the on-line automated integrated library system planned for The University of Tennessee, Knoxville Library is a bibliographic file consisting of master bibliographic records (MBRs) for every title owned by the Library. The bibliographic file must be shared by all modules or subsystems in the integrated library system. This section will discuss the MBRs which reside in that file in terms of: 1) their source and general characteristics; and 2) requirements for their storage, manipulation, and display. (Appendix B should be consulted for further details on the structure and format of the MBRs currently appearing on the OCLC archival tapes.)

5.1 SOURCE AND GENERAL CHARACTERISTICS

5.1.1 The current source of the Library's MBRs is the OCLC system. The Library's existing MBRs are stored on conventional OCLC archival tapes. However, the system must be capable of integrating into the bibliographic file MBRs which may be received from other bibliographic utilities or from other standard sources, such as the Carrollton Press REMARC Project or the Library of Congress.

5.1.2 The system must provide complete interfaces between itself and the bibliographic utility so that complete machine-readable MBRs can be transferred directly from the utility's local terminals to the local bibliographic file. Bidder must agree to upgrade the system's software so that this capability will not be lost in the event of any future changes in the format or display of bibliographic records by the utility.

5.1.3 The system must provide a "workform" for the on-line creation of MBRs when

5.1.3 (contd)

special circumstances dictate that use of the utility would be cumbersome or inappropriate.

5.1.4 The system must have the capacity to accept and store full OCLC/MARC records (or the MARC records of other utilities). The system also must accept MBRs which are less than "full," e.g., OCLC level "K" records. (See Library of Congress. MARC: Composite format for full definition of MARC records.)

5.1.5 MARC records may contain any character found in the current ALA character set. Provision must be made for these and for any future increases in this number. The system must be able to accept non-roman characters as the utilities develop the capacity to handle them.

5.2 REQUIREMENTS FOR STORAGE, MANIPULATION, AND DISPLAY

5.2.1 The system must be capable of providing for the conversion of the Library's MBRs, whether represented on OCLC archival tapes or other standard sources, to the appropriate format for use in any modules or subsystems.

5.2.2 The system must have the capability to input/output and display bibliographic data in national/international machine-readable formats -- currently MARC II and other LC MARC formats -- for each item regardless of the medium, including monograph, serial, document, map, score, manuscript, sound recording, and audiovisual plus other standard formats as they are developed. The system must not lose any of the tags, codes, delimiters, or any special designators of an MBR entering the bibliographic file so that it will be possible to display and output a wholly reconstructed MARC record.

5.2.3 The Library's MBRs include holdings information in 049 and 590 fields. (Described in detail in Appendix B.) The system must store and display

5.2.3 (contd)

complete holdings information sufficient to distinguish each physical item. Items must be distinguished either by identification number (barcode number or by detailed call number - copy, volume, part, etc.). The holdings statement should be able to accommodate both methods. For monographic sets, holdings should show the specific volumes in the set. For serials, the system should give a summary of holdings as well as detailed holdings.

The system must permit on-line modification of individual or multiple fields within MBRs in the bibliographic file and must not require reconstruction of the entire record for each transaction. The system must permit the deletion of entire records. Until an on-line catalog is available, the Library wishes to keep the bibliographic file current with its own card catalog, requiring frequent "maintenance" types of activities. Changes also may be necessary to remain current with LC practice. Changes to existing machine-readable records currently are accomplished using OCLC, requiring complete reconstruction of each record followed by a PRODUCE or UPDATE command. These changes currently number approximately 2500 withdrawals, 1500 transfers (changes of location), and 6000 changes in the content of individual records per year.

5.2.4 The system must be able to generate reports on demand. The system must be able to provide statistics from specific bibliographic collections by time period. The system must be able to provide a listing of records which lack specified data elements. Statistical information must include, but is not limited to:

- Number of bibliographic units cataloged by title count

5.2.4 (contd)

- Number of bibliographic units cataloged by volume count
- Bibliographic units cataloged, breakdown by classification number, then by title count
- Bibliographic units cataloged, breakdown by classification number, then by colume count
- Number of bibliographic units cataloged for any specific bibliographic collection, by title count
- Number of bibliographic units cataloged for any specific bibliographic collection, by volume count
- Breakdown by format (i.e., sound recording, microform, etc.)
- Number of bibliographic records maintained by the system
- Number and category of changes made to MBRs during any given period, including titles and volumes withdrawn from each bibliographic collection

5.2.5 The MBR ultimately must be retrievable through all data elements of the record. Initially, however, the MBR must be retrievable by search keys including, but not limited to the following:

- personal name
- corporate name
- conference name
- title
- uniform title
- any combination of name/title
- subject heading
- series
- classification number
- LCCN
- ISBN, ISSN, CODEN, bibliographic utility record number, GPO stock number, or other number

5.2.5 (contd)

- system assigned control number
- barcode/OCR-A label number

It should be possible to refine any search key by the addition of qualifiers; e.g., format, imprint date or range of dates, place, or other sub-element. It is desirable to be able to search the bibliographic file using Boolean logic connectors "and," "or," and "not." If this feature is available, an on-line instruction module for its use is also desirable. Access by partial field content and combinations of fields is highly desirable.

5.2.6 Authority control

5.2.6.1 Ultimately, the entire bibliographic file must be subject to the control of an authority system. This section is included in the present document, since it is desirable for the authority control system to be installed in advance of the on-line catalog module, thereby permitting improved public access capability as public access terminals are introduced.

5.2.6.2 For the purposes of this document, an authority system is defined as a mechanism to record a standardized form of a heading and to ensure consistent use of that standardized form throughout the bibliographic file. The word "heading" is defined as used in AACR2: a word or phrase used as an access point in a bibliographic record (author, subject, series, etc.). The title of a work (in this context) generally is not considered a heading unless used as a uniform title or series entry.

5.2.6.3 Authority control must include but not be limited to:

- Names -- personal, corporate, conference, geographic
- Topical subjects
- Uniform titles
- Series — must include decision of series treatment as well as name/title authority information

5.2.6.4 The authority control system must be based on the MARC authorities format. The system must input, display, and output authority records in the MARC or MARC compatible authorities format. The system must be capable of incorporating future changes in the MARC authorities format, or new national standard formats as they are developed. The system must have the capability to accept authority records from in-house generation, or from external sources, including but not limited to: bibliographic utilities, LC, and other standard sources. It must be possible to identify the source of the authority control record.

5.2.6.5 The authority system must allow on-line addition, deletion, or modification of entire authority records or individual fields within authority records. The authority system must provide a global search and replace function, in order to facilitate change of every occurrence of a heading in any MBR, with a single change of that heading in the authority file.

5.2.6.6 The authority system must be capable of linking automatically any heading in the authority file to each occurrence of that heading in designated fields and/or subfields in all MBRs. The system must be capable of linking automatically any heading in the authority file to any occurrence of that heading elsewhere in the authority file.

5.2.6.7 It must be possible for the system to match LC or other national standard authority records against the bibliographic file initially and periodically in order to ensure that the bibliographic file will remain consistent with LC and/or other national standard practices. The system must be capable of flagging or otherwise calling attention to a heading in designated fields and subfields of MBRs for which a match does not exist in the authority file.

5.2.6.8 The system must be able to generate reports on demand. The system must be able to provide statistics by time period, and statistical information must include but is not limited to:

- Number of heading changes made
- Number of MBRs affected by a heading change
- Number of authority records maintained by the system

A Request by
Dartmouth College Library
For Proposals
Regarding an
Automated Circulation System

7 May 1982

Dartmouth College Library
Hanover, NH 03755

59

Introduction

The Dartmouth College Library is seeking to install an online circulation system as an enhancement to its general program of library automation. To that end, the Library is requesting proposals from vendors based on the requirements outlined in this document.

Institutional Background

Dartmouth College, founded in 1769, is a private educational institution with an enrollment of approximately 4000 students. Three associated professional schools are also located on campus: Thayer School of Engineering, Tuck School of Business Administration, and Dartmouth Medical School. The Dartmouth College Library system supports these undergraduate and graduate programs through a network of eight libraries. Baker Library contains the humanities and social sciences collections and seven more specialized libraries house collections in various disciplines. In addition, there is an off-campus storage library housing seldom-used material. In all, the collection contains 1.5 million volumes (including over 40,000 serial titles), 95,000 maps, 860,000 microform items, audiovisual materials, and artifacts. In 1969, Dartmouth joined the Association of Research Libraries and, in 1979, became a member of the Research Libraries Group.

Dartmouth College has long been innovative in utilizing computer technology in administrative as well as educational processes. The Kiewit Computation Center provides central support for computer applications at the College. Most students will have used a computer terminal before graduating from Dartmouth and most employees find computers an integral part of the workplace. This is especially true of the Library. The library administration strongly believes that as the cost of library operations continues to increase, computer technology can provide more effective service for users with cost-saving advantages for library operations. With this in mind, the Library established an automation program in 1969. The Automation Department has overseen the production of Dartmouth's Union List of Serials as a computer output microform product as well as the computerization of the Library's acquisition functions. Several other programs provide such services as statistical record-keeping and billing to college accounts. The Library also utilizes the OCLC network and the Research Libraries Group RLIN shared cataloging system. Computer literature searching services are provided by the Library through several commercial vendor systems.

Since 1979, Dartmouth has been developing an online catalog system for all library users. The online catalog is designed so

that users can operate the system without any special computer skills or library training. Users will be able to search over 450,000 records. The online catalog is now available to users through the Bibliographic Retrieval Service computer in Latham, New York, but will soon be available on a local Library computer.

The next phase of development calls for the Dartmouth College Library system to integrate its online catalog with an online circulation system. Dartmouth is therefore looking for a system with appropriate design features to provide effective user service and the cost-saving advantages required by the Library's automation program.

Functional Requirements

The successful vendor's proposal shall respond in detail to the functional requirements outlined in this section. The following specific requirements are noted here because of their importance in a successful installation of a circulation system at Dartmouth:

- Circulation rules for various classes of items may vary with different borrower classes and different libraries. Designated operators must be able to override these rules.
- The status of any item should be updated online so that all inquiries will give up-to-date information.
- The system to be installed should have demonstrated a high degree of reliability regarding online system performance and data security.
- Due to the staffing situation at circulation locations, it is important that the system be designed both for easy operation by inexperienced operators and for quick operation by experienced operators.
- The circulation system must have rapid response time for all functions, especially those involving immediate borrower service.

The following paragraphs briefly describe the major requirements of the circulation system to be installed:

Borrower Files

The system shall support a borrower list of approximately 12,000 persons, representing several different classes of borrowers. The data may be entered either directly online or by magnetic tape or disc from an existing file of student, faculty, and staff data. The borrower files should be constructed so that borrowers may charge out materials on their first visit to the library and so that statistics may be compiled for various subclasses of borrowers. Each class of borrower may have unique borrowing privileges for various classes of items at each agency.

Item Files

Initially the system shall have the capacity for 750,000 brief records with provision for adding records for 30,000 volumes per year for the next five years. These records may be entered either online or by batch load from magnetic tape or disc. There shall be provision for as many as 100,000 items in the checkout file at any one time. The identification of all items shall be volume and copy specific. In addition to the standard bibliographic information about an item, a circulation history should also be stored indefinitely.

Inquiry

Users shall have access to the information stored in the system with varying levels of inquiry permitted. Some information shall be available to everyone and other information shall require access permission. The access points should include call number, author, title, item ID number, subject, borrower ID number, and borrower name.

Checkout

This online activity must combine fast service with a variety of checks--both of the patron and the item--ensuring that each transaction is consistent with circulation policy. Designated operators shall be able to override any block (see below) signalled by the system. . . .

Reserve Book Circulation

The system shall support an hourly and daily loan system for items placed "on reserve". It must be easy to change the standard reserve loan to an overnight loan coming due at a specified time the next day. It is highly desirable that reserve and general circulation be treated as a single function. The circulation system should be able to generate lists of reserve materials by term, course, professor, or reserve location.

Checkin

Items may be checked in at any circulation terminal or at a special checkin terminal, if the vendor provides such a terminal. The status of each item will always be verified before checkin is final. The system should effectively signal the occurrence of any condition other than being ready to reshelve.

Fines

Fines will be variable, depending on borrower status, item status, and owning agency. The system shall provide for grace periods and operator overrides. It should be possible to tie this function to the college billing system with provision for monitoring by staff persons.

Renewals

This function should be performed with or without the borrower's ID card. The system shall have appropriate checks to verify that an item is eligible for renewal before signalling the transaction. It should be possible to renew with one command a whole

group of items, such as all items charged to a particular borrower.

Holds

Holds may be placed either by library staff or by persons querying the Dartmouth Online Catalog. Items will be placed in queue on a first in first out basis with provision for altering the order of the queue. A hold may be placed for any item in the system at any terminal in the system.

Recalls

Items may be recalled by designated operators according to policy as it exists in an item's owning agency. Recalls may be initiated in any location for items in any location. The system shall not only generate notices at the appropriate time, but shall provide follow-up checks for non-compliance.

Intralibrary Loans

The system shall easily allow temporary reassignment of an item from one library to another. This feature will be especially important for the Storage Library and reserve reading rooms.

Interaction with the Dartmouth Online Catalog

The circulation system shall be able to interact with the Dartmouth Online Catalog. Users of the catalog should be able to determine the status of particular items and to place holds on items that are not on the shelf.

Blocks

The system shall employ a variety of function blocks. These blocks should occur wherever policy requires human discretion--such as borrower delinquency, a message, or a hold on an item. There should be provision for varying levels of override authority among system operators with respect to these function blocks.

Notices

A variety of public service notices shall be generated on demand or automatically at predetermined times. These notices may include recall, renewal, overdue, hold, fine, and special information notices. Each library will determine its own policy regarding the sending of notices. The system should create preaddressed notices. In addition to these batch produced notices, there should be printers available to produce paper copy lists, receipts, or notices at checkin and checkout locations.

Reports

The system shall monitor itself and the various transactions that it records. These reports shall be produced at designated intervals or on demand in a way that system performance, public service, and technical processes can be easily evaluated. Such reports may include listings of overdues by agency and/or borrower subclass. It shall be possible to determine various collection usage patterns by call number category, time, material type, location, borrower subclass, etc.

Response Time and Reliability

The response time for all online functions shall be less than five seconds, with the system being operational 98% of the time that the library is open for circulation.

Security

The various functions of the system should operate with various levels of security to protect information that is confidential and to make available to everyone information that is not confidential. The preferred approach to security shall be through a password system.

SELECTED SECTIONS

UNIVERSITY OF HOUSTON

INVITATION TO BID

SPECIFICATIONS

FOR

FURNISHING, DELIVERY, INSTALLATION, AND MAINTENANCE

OF AN

INTEGRATED LIBRARY SYSTEM

(PUBLIC ONLINE CATALOG AND CIRCULATION AND ACQUISITIONS SYSTEM)

FOR THE

UNIVERSITY OF HOUSTON LIBRARIES

HOUSTON, TEXAS

June 1982

UNIVERSITY OF HOUSTON

SELECTED SECTIONS

TABLE OF CONTENTS

1. BIDDING INFORMATION — Page

1.1 Purpose and Scope----1
1.2 Bidder Response Requirements----1
1.3 Alternate Bids----3
1.4 Inquiries Concerning This IFB----3
1.5 Performance Bond----4
1.6 Firm Bids----4
1.7 Delivery of Bids----4
1.8 Modification or Withdrawal of Bids----4
1.9 Evaluation of Bids----5
1.10 Demonstration of System----5
1.11 IFB Expenses----5
1.12 Disputes----5
1.13 Award of Contract----5

2. GENERAL INFORMATION

2.1 Background----6
2.2 The Existing System----6
2.3 The Planned System----7
2.4 Desired Equipment Configuration----8
2.5 Data to be Maintained and Work Loads----10
2.6 Contractual Expectations----14
2.7 Delivery Schedule----14
2.8 Installation----14
2.9 Functional Acceptance Test----15
2.10 System Reliability Acceptance Test----16
2.11 Full-Load Response Time Acceptance Test----17
2.12 Payment----18

3. PUBLIC ONLINE CATALOG SPECIFICATIONS

3.1 General----19
3.2 Bibliographic Records----19
3.3 Copy/Item Records----20
3.4 Indexes----21
3.5 Authority Control----21
3.6 Data Base Creation and Maintenance----22
3.7 Searches/Inquiries----23
3.8 Search Results----25
3.9 Statistical Reports----26

4. CIRCULATION SYSTEM SPECIFICATIONS

4.1 General----28
4.2 Borrower Control----29
4.3 Charge Activities----29
4.4 Renewal Activities----30
4.5 Discharge Activities----30

4. CIRCULATION SYSTEM SPECIFICATIONS (CONT.) Page

4.6 Blocks----31
4.7 Holds and Recalls----31
4.8 Fines and Fees----32
4.9 Overdues----34
4.10 Reserve Component----34
4.11 Materials Booking----35
4.12 Interlibrary Communications----36
4.13 Statistical Reports----36

5. ACQUISITIONS SYSTEM SPECIFICATIONS

5.1 General----38
5.2 Acquisition Records----38
5.3 Vendor Records----39
5.4 Fund Account Records----39
5.5 Selection Entry and Review----40
5.6 Purchase Order Preparation----41
5.7 Receiving----41
5.8 Claims and Cancelling----42
5.9 Statistical Reports----43

6. HARDWARE SPECIFICATIONS

6.1 General----44
6.2 Central Processing Unit----44
6.3 Magnetic Disk Storage----45
6.4 Magnetic Tape Drives----45
6.5 Line Printer----45
6.6 Character Printer----46
6.7 CRT Terminals----46
6.8 Optical Scanners----48
6.9 CRT Screen Printers----48
6.10 Portable Terminals----49
6.11 Communications----49

7. SYSTEM SOFTWARE SPECIFICATIONS

7.1 General----50
7.2 Operating System----50
7.3 Data Base Integrity----51
7.4 System Security----51
7.5 Text Editor----52

8. DOCUMENTATION

8.1 Hardware Manuals----53
8.2 System Software Manuals----53
8.3 Application Software Manuals----53

9. TRAINING Page

9.1 Manager Training----54
9.2 Computer Room Staff Training----54
9.3 Supervisor Training----54
9.4 Data Entry Operator Training----55

10. HARDWARE AND SOFTWARE MAINTENANCE

10.1 Hardware Maintenance----56
10.2 Software Maintenance----57

SPECIFICATION RESPONSE FORMS----58

COST RESPONSE FORMS----73

LIST OF OPERATIONAL INSTALLATIONS----76

Functions to be performed include: (a) selection entry and review; (b) requisition preparation; (c) receiving; (d) fund accounting; (e) claiming and cancelling; (f) supplier file creation and maintenance; and (g) statistical reports display and printing.

2.4 Desired Equipment Configuration

2.4.1 Summary of Equipment

The following is a summary of the equipment expected to be bid:

```
  1---Central Processing Unit, Operator Console, etc.
  *---Magnetic Disk Storage and Controllers
  2---Magnetic Tape Drives and Controllers
  1---Line Printer and Controllers
  1---Character Printer and Controller
104---CRT Terminals
 15---Optical Scanners and Controllers
  2---Portable Terminals
 16---CRT Screen Printers
 33---1200 Baud Modems (or equivalent arrangement) for Remote Sites
 11---1200 Baud Dial-Up Modems for Remote Sites
  1---Communications Processor/Controller
```

The number and type of modems may vary depending upon how a vendor bids the communications equipment. The communications processor or equivalent equipment may also vary.

2.4.2 Distribution of Equipment

The equipment above will be distributed in the following locations:

M.D. Anderson Library

```
  1---CPU, Operator Console, etc.
  *---Magnetic Disk Storage and Controllers
  2---Magnetic Tape Drives/Controllers
  1---Line Printer and Controller
 61---CRT Terminals
       1---Computer Room
       4---Cataloging Department
       4---Acquisitions Department
       4---Serials Unit
       1---Reference Office
       1---ILL Office
       1---Documents Office
       6---Circulation Department
       3---Reserve Room
       2---Audiovisual Services
       2---Information Desk
      10---Card Catalog Area
       4---PRR
       1---Special Collections
```

70

* Depends upon bid.

4---Floor 2
4---Floor 3
3---Floor 4
2---Floor 5
2---Floor 6
2---Spares
9---Optical Scanners/Controllers
4---Circulation Department
2---Reserve Room
1---Catalog Department
1---Audiovisual Services
1---Spare
7---CRT Screen Printers
1---Catalog Department
1---Acquisitions Department
1---Serials Unit
1---Circulation Department
2---Information Desk
1---Audiovisual Services
2---Portable Terminals
1---Communications processor/Controller

Architecture Library (Central Campus)

4---CRT Terminals
1---Optical Scanner/Controller
1---CRT Screen Printer
4---1200 Baud Modems (or equivalent arrangement)

Optometry Library (Central Campus)

4---CRT Terminals
1---Optical Scanner/Controller
1---CRT Screen Printer
4---1200 Baud Modems (or equivalent arrangement)

Music Library (Central Campus)

4---CRT Terminals
1---Optical Scanner/Controller
1---CRT Screen Printer
4---1200 Baud Modems (or equivalent arrangement)

Pharmacy Library (Central Campus)

4---CRT Terminals
1---Optical Scanner/Controller
1---CRT Screen Printer
4---1200 Baud Modems (or equivalent arrangement)

Law Library (Central Campus)

4---CRT Terminals
1---CRT Screen Printer
4---1200 Baud Modems (or equivalent arrangement)

Downtown College Library

12---CRT terminals
2---Optical Scanners/Controllers
2---CRT Screen Printers
1---Character Printer/Controller
12---1200 Baud Modems (or equivalent arrangement)

Clear Lake City Campus Library

2---CRT Terminals
1---CRT Screen Printer
2---1200 Baud Dial-Up Modems

Victoria Campus Library

2---CRT Terminals
1---CRT Screen Printer
2---1200 Baud Dial-Up Modems

Other

Dial-up terminal systems for installation in offices/laboratories on the Central Campus (to be purchased only if funds are available).

7---CRT Terminals
7---1200 Baud Dial-Up Modems

2.5 Data To Be Maintained and Work Loads

2.5.1 Bibliographic Records

Machine-readable bibliographic records in OCLC/MARC format will be used to load the Public Online Catalog. The average length of these records will average approximately 800 character/bytes.

The initial load of bibliographic records is as follows:

UHCC Libraries-----250,000
UHCC Law Library----20,000
UHDC Library-------150,000
UHCLC Library------170,000
UHVC Library-------140,000
730,000 TOTAL

The amount of duplication among these files is unknown.

In addition to the initial load, bibliographic records will be added regularly on an annual basis. An estimate of the number of bibliographic records to be added the first year after the initial load is as follows:

UHCC Libraries-----100,000
UHCC Law Library-----3,000
UHDC Library--------12,000
UHCLC Library--------7,000
UHVC Library---------8,000
130,000 TOTAL

72

2.10 System Reliability Acceptance Test

2.10.1 A System Reliability Acceptance test shall be conducted onsite after the vendor has installed the system and has certified in writing that the system as specified in this IFB is operational.

2.10.2 The system shall operate at an average level of reliability of no less than 97% for a period of 45 consecutive days.

2.10.3 The average level of reliability shall be determined as follows:

The downtime factor shall be calculated by multiplying the downtime hours (those daily operational hours between the time the vendor has been notified of a system failure and the time the system is fully operational) by a downtime coefficient, as defined in a Downtime Coefficient Table, for example:

Failure	Coefficient	
Critical Operations Failure; e.g.:		
Online Catalog Record Creation and Maintenance	1.0	
Online Catalog Searches/Inquiries	1.0	
Charge and Discharge	1.0	
Holds and Renewals	1.0	
Borrower Record Creation and Maintenance	1.0	
Selection Entry and Review	1.0	
Requisition Order Preparation	1.0	
Receiving	1.0	
Non-Critical Operations Failure; e.g.:		
Report Printing	0.25	After 24-Hour Grace Period
Other Software Failures Not Significantly Affecting System Operation	0.1	Beginning 5 days After Service Call.
Hardware Failure: e.g.:		
Central Processing Unit	1.0	
Disks (all)	1.0	
Individual disks, if system operational	0.1	Per disk
Tape Drive	1.0	
Line Printer	1.0	
Serial Printer	0.1	After 24-Hour Grace Period
CRT Terminal	0.1	Per Terminal
Optical Scanner	0.1	Per Scanner
CRT Screen Printer	0.25	Per Printer
Communications Equipment	0.1	Per Piece

2.10.4 Total system downtime shall equal the sum of the downtime factors divided by the sum of daily library operation hours.

2.10.5 Maintenance logs shall be kept by the Libraries in order to facilitate the measurement of system reliability.

2.10.6 Downtime shall be calculated to the nearest one-tenth hour and calculated as a percentage of the library total operating hours during the period.

2.10.7 In the event of a failure to meet the 3% downtime maximum, the 45 days acceptance test shall begin again when the problem is resolved.

2.11 Full-Load Response Time Acceptance Test

2.11.1 A Full-Load Response Time Acceptance Test shall be conducted onsite after the vendor has installed the system and has certified in writing that the system as specified in this IFB is operational, after all software has been installed and passed the Functional Acceptance Tests, and after the initial bibliographic data file has been loaded.

2.11.2 The Libraries shall provide operators, test log keepers, and data recorders for each terminal, during the tests.

2.11.3 The test shall evaluate the system within the following constraints:

a. A library-specified mix of terminal dedications; e.g., 50% of the terminals dedicated to the searches/inquiries in the Public Online Catalog; 20% to data input-edit; 15% to circulation; and 15% to acquisitions.

b. A library-specified "peak load" or "worst case" job mix; e.g., 1,000 charge and renewal transactions; 200 discharges; 200 file inquiries (100 of which are subject inquiries); 100 data input-edits, 2 batch-mode jobs, in a single hour.

2.11.4 The test shall provide unequivocal evidence (i.e., the results may be entered into a written log) that the system meets response-time performance requirements under the "peak load" condition.

2.11.5 The test results may be inspected and evaluated by a consultant or other library- or vendor-specified party.

2.11.6 The system shall, operating in the worst case test, exhibit average response times not exceeding:

a. Six seconds for data input-edit.

b. Six seconds for file inquiries by non-subject index.

c. Eight seconds for file inquiries by subject index.

d. Two seconds for charge, renewal, discharge, and other circulation and acquisitions functions.

2.11.7 Average system response times are the totals of all the transaction times in a category (e.g., charges) divided by the total number of transactions in those categories.

2.12 Payment

2.12.1 The Libraries plan to pay for the system in three payments: (a) approximately 50% of the total system cost shall be paid upon the signing of a contract or agreement with the vendor, as a down payment; (b) approximately 25% of the total system cost shall be paid upon passing of the three system acceptance tests; and (c) the balance shall be paid approximately six months after the second payment.

2.12.2 Upon installation, acceptance, and final payment, the Libraries shall receive clear title to all hardware and all software not under a licensing arrangement.

6. HARDWARE SPECIFICATIONS

(Vendors are reminded that they must respond to each specification in this section by indicating one of the following in the appropriate part of the Specification Response Form at the end of this document: YES (feature or function is available); YES/D (feature or function is available, but with minor differences noted); YES/F (feature or function will be available at date specified); and NO (feature or function not available).

6.1 General

6.1.1 All hardware shall be unmodified, "off-the-shelf" equipment.

6.1.2 All hardware shall have a 90-day warranty, effective from the date of installation.

6.1.3 All hardware shall be new, a part of the vendor's standard product line, amd certified as maintainable.

6.1.4 All essential cabinets, controllers, cabling, and other interfaces shall be provided as part of a bid.

6.1.5 All hardware shall be certified to qualify for full-coverage preventive and remedial maintenance

6.1.6 (Optional) The system shall accept a mixture of different manufacturer's CRT terminals.

6.2 Central Processing Unit

6.2.1 The Central Processing Unit (CPU) bid for initial installation shall have sufficient input/output paths, core memory, and other features to perform the expected workloads described in Section 1.5 and to allow concurrent operation of the peripherals identified in Sections 6.2 through 6.10.

6.2.2 The system bid shall be a multi-processor unit.

6.2.3 Each processor of the CPU shall have its own individual power supply and input/output channels to ensure continuous processing should one processor fail.

6.2.4 Each processor shall work concurrently and share the computing load between them to increase total system capacity.

6.2.5 In case of failure of one processor, the system shall automatically shift the system's workload to the remaining processor(s), without human intervention.

6.2.6 The CPU bid shall be capable of accepting modular additions to memory up to twice the installed core memory, through addition of memory in each processor and through addition of additional processors, without reprogramming.

6.2.7 The system bid shall include a console with keyboard and visual display for communication between an operator and the computer and for control of batch programs.

6.2.8 The system shall have power failure protection for the equipment.

6.3 Magnetic Disk Storage

6.3.1 Sufficient disk storage shall be bid to store the initial files described in Section 2.5 and to store the additional records expected to be added for three years after installation, at the rates defined in Section 2.5.

6.3.2 Sufficient additional disk storage shall be bid to store the system software and other software.

6.3.3 The system shall be expandable in the future to at least double the disk storage capacity without need for additional disk controllers and without changing the basic hardware or software, except for adding new disk drives.

6.3.4 A disk pack shall be included for each drive bid, plus sufficient scratch packs required for system maintenance.

6.3.5 Sufficient disk packs shall be included to accomodate the total backup system recommended by the bidder.

6.3.6 All disk packs shall be error-free and formated.

6.4 Magnetic Tape Drives

(Note: The second drive will not be purchased if sufficient funds are not available).

6.4.1 The tape drives bid shall include necessary controllers.

6.4.2 The tape drives shall be able to read and write, with read-after-write check.

6.4.3 The tape drives shall accept half-inch tape, recorded at 1600 BPI, nine-track tape.

6.4.4 The tape drives shall operate at speeds of 20-25 IPS minimum.

6.5 Line Printer

6.5.1 The line printer shall include any necessary controller.

6.5.2 The line printer shall have 132 print positions.

6.5.3 The line printer shall have print spacing of 10 characters per inch horizontal and six or eight lines per inch vertical, switch selectable.

6.5.4 The line printer shall be adjustable to accept paper or forms from four inches to 14-7/8 inches in size horizontal.

6.5.5 The line printer shall have top-of-forms sensing.

6.5.6 The line printer shall have a manual forms eject.

6.5.7 The line printer shall have a pin-feed, continuous forms tractor feed.

6.5.8 The line printer shall have programmed carriage control.

6.5.9 The line printer shall have high-quality print on at least four-part paper.

6.5.10 The line printer shall have a rated speed of not less than 300 lines per minute when printing full 132-character lines.

6.5.11 The line printer shall have a standard ASCII 64-character set, with an optional 96-character ASCII set.

6.5.12 (Optional) The train or chain shall be removable to change type fonts and character sets.

6.6 Character Printer

6.6.1 The character printer shall include any necessary controller.

6.6.2 The character printer shall have 132 print positions.

6.6.3 The character printer shall have print spacing of 10 characters per inch horizontal and six or eight lines per inch vertical, switch-selectable.

6.6.4 The character printer shall have top-of-forms sensing.

6.6.5 The character printer shall have a manual forms eject.

6.6.6 The character printer shall have programmed carriage control

6.6.7 The character printer shall be adjustable to accept paper from four inches to 14-7/8 inches in size horizontally.

6.6.8 The character printer shall have a pin-feed continuous forms tractor feed.

6.6.9 The character printer shall have high-quality print on at least four-part paper.

6.6.10 The character printer shall have a rated speed of not less than 160 characters per second when printing full 132-character lines.

6.6.11 The character printer shall have a standard ASCII 64-character set.

6.7 CRT Terminals

6.7.1 The CRT terminal bid shall have a minimum display capacity of 1,920 characters with a screen display image of at least 24 displayable lines vertically and with 80 characters horizontal on each line.

6.7.2 The terminal shall have at least a twelve-inch diagonal screen.

6.7.3 The terminal shall meet all current and reasonable future OSHA and other pertinent regulatory agency requirements regarding radiation electromagnetic interference (EMI), noise level, user fatigue, etc.

6.7.4 The terminal's display intensity shall be variable by the operator via a manual brightness and/or contrast control knob.

6.7.5 The terminal's display shall provide a nondestructable single-character cursor that is both addressable and readable via programming.

6.7.6 The terminal shall have a power on/off switch that is user-accessible.

6.7.7 The terminal shall have keys designated for special functions in each system.

6.7.8 The terminal's display shall provide for character or field blinking or intensity control.

6.7.9 The terminal shall be capable of automatically skipping the cursor to the next programmed tabulation stops.

6.7.10 The terminal shall have computer-controlled protected/unprotected auto-skip feature.

6.7.11 The terminal shall be capable of displaying both upper and lower case characters.

6.7.12 The terminal shall have program controlled bright/normal/dark intensity.

6.7.13 The terminal shall have the capability of allowing programming to erase the entire screen at one time.

6.7.14 The terminal shall have an audible alarm or bell.

6.7.15 The terminal shall use American-English block-style alphabetic and numeric characters, with true descenders.

6.7.16 The terminal's display resolution shall equal or exceed that obtainable with a dot matrix five dots wide by seven dots high.

6.7.17 The terminal shall be RS-232C compatible with the CPU bid.

6.7.18 Each terminal shall be plug-to-plug compatible with any other CRT terminal bid, to allow terminals to be moved from site to site without hardware modification.

6.7.19 The terminal shall operate properly at standard data transmission rates using standard serial asynchronous communications line protocol.

6.7.20 The terminal shall provide editing features which allow character insert/delete, character display/erase, and selected character repeat.

6.7.21 The terminal shall have buffering of at least 1,920 characters before transmission to the CPU.

6.7.22 The terminal shall have an additional I/O port which will enable it to be interfaced with a printer device.

6.7.23 (Optional) Terminals other than the ones bid shall interface with the system being bid.

6.7.24 (Optional) The ALA 192-character, extended 8-bit ASCII set shall be available on the terminal, which may be interfaced to the system bid.

6.8 Optical Scanners

6.8.1 Hand-held scanners shall be bid, with flexible cords at least 42" in length unflexed or 6' flexed.

6.8.2 The scanner shall be capable of reading standard Optical Character Recognition (OCR) labels, or, industry-compatible barcode labels.

6.8.3 All necessary controllers, cables, and other hardware essential to connect the scanners to the CRT terminals shall be bid.

6.8.4 The scanner shall emit an audible "beeper" tone when a label is read correctly.

6.8.5 The scanner shall be capable of checking digit read automatically.

6.9 CRT Screen Printers

6.9.1 The CRT screen printer shall be RS-232C connectable to the printer or I/O port of the CRT terminal bid.

6.9.2 The printer shall have 80 print positions.

6.9.3 The printer shall have pin-feed, continuous forms tractor feed (adjustable).

6.9.4 The printer shall have full standard ASCII character set, with upper and lower case.

6.9.5 The printer shall have six lines per inch vertical.

6.9.6 The printer shall have a rated speed of not less that 30 cps when printing full 80-character lines.

6.9.7 The printer shall have top-of-forms sensing.

6.9.8 All necessary cabling to connect the printer to the CRT terminal shall be included.

6.9.9 The printer shall have a manual line feed.

6.9.10 (Optional) The printer shall have a buffer for a minimum of 1,920 characters of data.

6.10 Portable Terminals

6.10.1 The portable terminal shall be capable of offline entry and storage of from 3,000 to 5,000 circulation transactions or inventory records.

6.10.2 The portable terminal shall be capable of transmitting its data to the CPU from any standard terminal connector.

6.11 Communications

6.11.1 The communications control hardware shall be sufficient in capacity and configration to process the communications input and output outlined in Section 1.4.

6.11.2 Vendors shall configure communications equipment which will best fit their systems and which will maximize communications efficiency and effectiveness while minimizing costs to the University of Houston.

6.11.3 Rotary line interfaces shall be included to accomodate a minimum of five remote users to be using I/O ports simultaneously via dial-up facilities.

7. SYSTEM SOFTWARE SPECIFICATIONS

(Vendors are reminded that they must respond to each specification in this section by indicating one of the following in the appropriate part of the Specification Response Form at the end of this document: YES (feature or function available): YES/D (feature or function available, but with minor differences noted); YES/F (feature or function will be available at date specified); and NO (feature or function not available).

7.1 General

7.1.1 All system software necessary to operate the computer system to perform the functions outlined and support the functions specified in Sections 3 through 6 shall be supplied by the vendor.

7.1.2 Future enhancements to the system software shall be made available to the Libraries as long as it uses the system bid.

7.2 Operating System

7.2.1 The system shall include a real-time, multi-user operating system.

7.2.2 The operating system shall provide for the processing of jobs in accordance with established priorities by scheduling jobs, overlapping jobs requiring no external intervention, and issuing messages to the operator as needed.

7.2.3 The operating system shall provide for the queing and dispatching of I/O operations in order to provide concurrent multi-task I/O support.

7.2.4 The operating system shall provide a means of coordinating transfer of control between programs or tasks after completion of external events, waiting on one program or task, starting another, and later restarting the first program or task without loss of program or task integrity.

7.2.5 The operating system shall include error-handling routines which allow one task to recover or abnormally terminate while other processing continues and assures that operator intervention is kept to a minimum.

7.2.6 The operating system shall adjust to the addition of future vendor-compatible peripheral equipment with only minor software changes.

7.2.7 The operating system shall provide for the receiving, processing, and dispatching of messages from remote CRT terminals and other devices.

7.2.8 The operating system shall be adequate to manage efficiently the operation of the multi-programmed conditions described in the work-loads in Section 1.5.

7.2.9 The operating system shall allow concurrent operation of more than two tasks.

7.2.10 The operating system shall provide for automatic scheduling and loading of programs into memory.

7.2.11 The operating system shall provide an interrupt-handling program that coordinates transfer of control between programs after an interrupt.

7.2.12 The operating system shall support an overlay or subtask system which allows a program to be run in segments.

7.2.13 The operating system shall include a bootstrap function that allows the operator to specify from the front panel or operator console the device to originate the operating system.

7.2.14 The operating system shall provide a set of diagnostic routines, loadable from more than one type of external storage device, which will test all of the hardware units (including CPU, main memory, magnetic tape drives, disk devices, and other peripherals) and which isolates faults down to the component level.

7.2.15 The operating system shall protect data files, or parts of them, to prevent injury, update, deletion, and creation without proper authorization, through the use of passwords and/or other security mechanisms.

7.3 Data Base Integrity

7.3.1 Programs shall be provided which perform backup of all system data files onto some removable magnetic storage media.

7.3.2 Public Online Catalog, Circulation, and Acquisitions system transactions which result in new data records, or in modification of any existing data records, shall be logged on an external storage medium (tape, disk, etc.) physically distinct from the devices holding the data bases being thus backed up.

7.3.3 Procedures and programs shall be provided which enable recovery from hardware or software failure.

7.4 System Security

7.4.1 All application data files shall be protected from unauthorized access (inquiry, update, deletion, or creation as applicable to each piece of data), through the use of passwords and/or other security mechanisms.

7.4.2 All system files (programs, application data, operating system, etc.) shall be protected from unauthorized access (inquiry/read/copy actions, modification, deletion, etc.), through the use of passwords and/or other security mechanisms.

7.4.3 Functions not authorized for use by the public shall not be accessible from terminals assigned to the Public Online Catalog.

7.4.4 Entry into all other functions except inquiry shall be impossible from the Public Online Catalog terminals, even through passwords.

7.4.5 A method of preventing determination of user's passwords shall be provided.

7.4.6 The libraries shall be able to specify which functions can be performed at individual terminals.

7.4.7 The libraries shall be able to change or delete passwords and to change functions authorized to passwords at will.

7.5 Text Editor

7.5.1 A text editor shall be provided on the system.

7.5.2 The text editor shall be able to create records in a data file or a high-level source program file.

7.5.3 An operator shall be able to change records in a data file or a high-level source program file.

7.5.4 An operator shall be able to delete records in a data file or a high-level source program file.

7.5.5 The text editor shall be operable from the operator's console and from other specific terminals.

7.5.6 A user shall be able to print text from data entered into the text editor.

8. DOCUMENTATION

(Vendors are reminded that they must respond to each specification in this section by indicating one of the following in the appropriate part of the Specification Response Form at the end of this document: YES (feature or function available); YES/D (Feature or function available, but with minor differences noted); YES/F (feature or function will be available at date specified); and NO (feature or function not available).

8.1 Hardware Manuals

8.1.1 Two complete sets of descriptive and operational manuals for each separate equipment model bid shall be provided upon its installation.

8.1.2 Schematic drawings for the CRT terminals and screen printers shall be provided upon installation.

8.1.3 Modifications or enhancements to the manuals or completely revised manuals shall be provided to the Libraries on a continuing basis for the duration of its contracts with the successful bidder.

8.2 System Software Manuals

8.2.1 Two complete sets of descriptive and operational manuals for the operating system and data base management system (if appropriate) shall be provided upon software installation.

8.2.2 Two complete reference and programmer guides to the programming language used shall be provided upon software installation.

8.2.3 Modifications or enhancements to the manuals or completely revised manuals shall be provided to the Libraries on a continuing basis for the duration of its contracts with the successful bidder.

8.3 Application Software Manuals

8.3.1 A minimum of two complete sets of reference, training, and operational manuals for monitoring and operating the system on a day-to-day basis shall be provided upon system installation.

8.3.2 A minimum of two complete sets of reference, training, and operations manuals for the Public Online Catalog, Circulation, and Acquisitions systems shall be provided upon system installation (additional copies may be requested).

8.3.3 Modifications or enhancements to manuals or completely revised manuals shall be provided to the Libraries on a continuing basis for the duration of its contracts with the successful bidder.

10. HARDWARE AND SOFTWARE MAINTENANCE

(Vendors are reminded that they must respond to each specification in this section by indicating one of the following in the appropriate part of the Specification Response Form at the end of this document: YES (feature or function available); YES/D (feature or function available but with minor differences noted); YES/F (feature or function will be available at date specified); and NO (feature or function not available).

10.1 Hardware Maintenance

10.1.1 All-expense, flat-rate remedial hardware maintenance for the equipment shall be provided at the equipment site Monday through Friday, 8:00 a.m. through midnight, Saturday, 9:00 a.m. through 6:00 p.m., and Sunday, 12:00 noon through 12:00 midnight (all CDT/CST).

10.1.2 Normal remedial maintenance contact by vendor maintenance personnel shall be guarenteed to be within two hours after notification of need, with remedial work begun within four hours after vendor contact, except in rare and unusual circumstances, through mutually agreed-upon contacting procedures.

10.1.3 All-expense, flat-rate preventive hardware maintenance for the equipment shall be provided at the equipment site, at times mutually agreed upon by the libraries and the vendor (it is desired that preventive maintenance be performed outside normal operating hours of the libraries).

10.1.4 An adequate supply of repair parts shall be maintained locally to repair a minimum of 85% of all hardware failures during a calendar year.

10.1.5 Repair parts to meet the remaining 15% of hardware failures shall be made available within twenty-four hours (continuous time), except under rare and unusual circumstances.

10.1.6 Records/reports of each remedial or preventive maintenance activity performed shall be maintained at the user site.

10.1.7 Maintenance reports shall include as a minimum: (a) date and time notified; (b) date and time of arrival; (c) type and model of machine serviced; (d) time spent for repair or service; (e) description of malfunction or service; (f) date and time equipment was made operational; and (g) signature of both maintenance and library representatives.

10.1.8 The vendor shall have a cost-free telephone number for hardware maintenance calls.

10.2 Software Maintenance

10.2.1 All-expense, flat-rate maintenance of all system and application software shall be provided Monday through Friday, 8:00 a.m. through midnight, Saturday, 9:00 a.m. through 6:00 p.m., and Sunday, 12:00 noon through 12:00 midnight (all times CDT/CST).

10.2.2 The vendor shall perform software maintenance by a dial-in arrangement.

10.2.3 The vendor shall provide a cost-free telephone number for software maintenance calls.

10.2.4 The vendor shall systematically inform the libraries of on-going system software enhancements as they are developed and shall solicit library input when critical system changes are being contemplated, and stipulate cost to the libraries, if any, for software enhancements.

10.2.5 The vendor shall guarantee the right of the libraries to upgrade to a later-developed and improved system.

SURVEY RESULTS ON THE INTEGRATED LIBRARY INFORMATION SYSTEM

I. System Functions.
A. Chart.

On the following chart, please indicate which functions you have automated or are now automating, intend to automate, or do not intend to automate as part of an integrated library information system (as defined in the cover memorandum).

In the "Plan to Develop Function" column you should choose only one of the four possible choices for each of the separately numbered functions listed on the chart (you may choose different options for each of the separately listed functions or subfunctions). Within this column, "local" development includes new software already developed or being developed at your library or in cooperation with other libraries. Do not include large network systems (see "Turnkey Systems" below). "Purchase software" includes systems where the library has purchased or intends to purchase software, but has or will locally mount or adapt those programs (e.g., NOTIS). "Turnkey systems" includes vendor systems (e.g., DataPhase, Geac) and centralized large network or utility systems (e.g., OCLC, RLIN) where the vendor or utility provide all necessary hardware and software. "Not sure how" implies that your library does have definite plans to automate that function, but a course of action has not yet been selected. If possible, provide a written statement of which possibilities are under most active consideration.

If you have no definite plans to automate a particular function, indicate this in the last column ("No present plans to develop function").

RESPONSE: n = 31. All totals do not equal 100% because of rounding. Responses of the subfunctions listed calculated as follows: 1 = 3.2%; 2 = 6.5%; 3 = 9.7%; 4 = 12.9%; 5 = 16.1%; 6 = 19.4%; 7 = 22.6%; 8 = 25.8%; 9 = 29.0%; 10 = 32.3%; 11 = 35.5%; 12 = 38.7%; 13 = 41.9%. Averages shown for the four main functions are based on the averages of the subfunctions as shown.

Functions	Have developed/Plan to develop function as part of an integrated library system:				No present plans for this ILIS function
	Locally	Purchase software	Turnkey system	Not sure how	
A. ACQUISITIONS (includes monographs & serials):	33.8%	5.6%	25.3%	25.8%	10.6%
1. Ordering	32.3%	6.5%	29.0%	22.6%	9.7%
2. Claiming	32.3%	6.5%	29.0%	25.8%	6.5%
3. Serials Check-in	29.0%	3.2%	19.4%	35.5%	12.9%
4. Inprocess control	38.7%	6.5%	29.0%	19.4%	6.5%
5. Binding control	25.8%	3.2%	16.1%	29.0%	25.8%
6. Accounting	38.7%	6.5%	25.8%	22.6%	6.5%
7. Vendor control	32.3%	6.5%	29.0%	25.8%	6.5%

LIST OF FUNCTIONS CONTINUED ON THE NEXT PAGE

Functions	Have developed/Plan to develop function as part of an integrated library system: Locally	Purchase software	Turnkey system	Not sure how	No present plans for this ILIS function
B. CATALOGING (maintenance)	29.0%	8.6%	37.6%	14.0%	11.9%
1. Bibliographic data	22.6%	9.7%	41.9%	12.9%	12.9%
2. Authority control	29.0%	6.5%	35.5%	16.1%	12.9%
3. Holdings data	35.5%	9.7%	35.5%	9.7%	9.7%
C. CIRCULATION	27.9%	9.7%	35.5%	20.5%	6.5%
1. Charge-out/Charge in of materials	29.0%	9.7%	35.5%	19.4%	6.5%
2. Recall and billing	29.0%	9.7%	35.5%	19.4%	6.5%
3. Reserve lists & charge-out	25.8%	9.7%	35.5%	22.6%	6.5%
D. ACCESS (ONLINE CATALOG)	33.9%	8.9%	27.4%	19.4%	10.5%
1. Traditional searching mechanisms (author, title, etc.)	32.3%	12.9%	35.5%	12.9%	6.5%
2. Enhanced search capabilities (e.g., keyword, Boolean operators)	29 0%	9.7%	32.3%	22.6%	6.5%
3. Access to non-catalog data, e.g., inprocess, holdings, circulation	41.9%	6.5%	25.8%	12.9%	12.9%
4. Order Commands, e.g., request printouts, document delivery, holds	32.3%	6.5%	16.1%	29.0%	16.1%
AVERAGE OF ALL CATEGORIES	31.1%	8.2%	31.5%	19.9%	9.9%

B. If you are planning to (or did) implement the system in stages, what is (was) the priority order for implementation?

RESULTS: n = 26. 9.8% of survey respondents did not respond to this question. 6.4% were not planning to implement the system in stages. The remaining 83.8% were implementing the system in stages. Responses were weighted, and the following rank order indicates the weight assigned.

Stage	Category	Weight
1	Cataloging (Maintenance)	78
2	Circulation	73
3	Access (online catalog)	54
4	Acquisitions	51

II. Planning Responsibilities.

1. Does (or did) your library have an established committee for the oversight of the development of an integrated library information system?

RESULTS: 6.4% of the survey respondents did not respond to this question. Percentages shown are of those who responded to this question (n = 29).

55.2% Yes [n = 16]

44.8% No [n = 13]

2. Is (was) this committee separate from the regular administrative group of the library (e.g., department heads group, assistant university librarians group, etc.)?

RESULTS: 51.6% of the survey respondents did not respond to this question (6.4% did not respond to question 1 above, and the remaining 45.2% responded "no" to that question). Percentages shown are of those who responded to this question (n = 16).

94.0% Yes [n = 15]

6.0% No [n = 1]

3. What position has the primary responsibility and authority for the development of the integrated library information system?

RESULTS: 16.1% of the survey respondents did not respond to this question. The responses given below are in rank order. (n = 26)

27.0% Assistant University Librarian for Technical Services [n=7]

15.4% University Librarian (Director/Dean of Libraries) [n=4]

15.4% Assistant University Librarian for Technical Services and Automation [n=4]

11.5% Head of Library Systems [n=3]

11.5% Other position [n=3]

7.7% Assistant University Librarian/Coordinator of Automation [n=2]

7.7% Assistant University Librarian for Administrative Services [n=2]

3.8% No position primarily responsible [n=1]

III. Data Available.

A. For the retrospective conversion (recon) of the bibliographic records for your library that are not now represented in machine-readable form, did you or do you intend to do:

RESULTS: Two results reported. Column 1 is of all respondents (n = 31). Column 2 is only of those libraries that do have definite plans.

1	2		
54.8%	68.8%	"Full" recon (75-100% of the collection)	[n = 17]
19.4%	24.0%	Partial" recon (25-75% of the collection)	[n = 6]
3.2%	4.0%	"Minimal" recon (less than 10-25%)	[n = 1]
3.2%	4.0%	Little recon (0-10% of the collection)	[n = 1]
19.4%	----	No definite plans at this time for recon	[n = 6]

B. Will converted records have:

RESULTS: Two results reported. Column 1 is of all respondents (n = 31). Column 2 is only of those libraries that do have definite plans.

1	2		
6.5%	8.0%	Short record only	[n = 2]
74.1%	92.0%	Full bibliographic information	[n = 23]
19.4%	----	No definite plans	[n = 6]

IV. What are the primary factors that your library has used or is using to justify (to the university, funding agencies, etc.) the development of an integrated library information system?. Rank the top five of the following items in order of importance.

RESULTS: Results were weighted, with n = 412. Factors are listed in rank order, along with the weighted percentage of respondents who considered this factor to be important.

Rank	Percent	
1	18.2%	Increase the amount of information available to the public
2	17.7%	The ability to provide distributed access to data
3	14.3%	Improved access to data (via keywords, Boolean operators, etc.)
4	9.0%	To increase staff productivity by simplifying file maintenance
5	8.3%	Centralization of all library data for the public
6	5.9%	To provide better management data, reports and statistics
6	5.9%	To provide more up-to-date information
7	5.6%	To reduce the number of staff or avoid any increase in staff
8	3.9%	To avoid redundant keying of data
9	2.4%	Provide for more accurate record-keeping
9	2.4%	Improved service
10	1.5%	A perception that automation will reduce costs
10	1.5%	To simplify systems for internal record-keeping and control
11	0.9%	Improved collection management information
11	0.9%	Automated authority control and ability to do "global updates"
12	0.7%	Networking capabilities
12	0.7%	The provision to automate functions now done in a manual mode
13	0.2%	The reduction in the amount of paper generated

V. Factors perceived to inhibit implementation of an integrated library information system. Rank the top five of the following items in order of importance.

RESULTS: Results were weighted, with n = 341. Factors are listed in rank order, along with the weighted percentage of respondents who considered this factor to be important.

Rank	Percent	
1	23.4%	Lack of funds to carry out plans
2	21.7%	Cost to develop (hardware and software)
3	17.3%	Cost to maintain and operate
4	9.4%	Lack of staff to develop and implement system
5	7.3%	Problems too advanced for current automation capabilities

V. Factors perceived to inhibit implementation of an integrated library information system. (CONTINUED)

6	5.6%	Difficulty of the planning task
7	4.4%	Lack of university administration support
8	3.2%	System not perceived as saving money
9	2.1%	Staff resistance or lack of support
10	1.4%	Question the advisability of an ILIS
11	1.2%	Missing linkage between experts in automation and librarians
11	1.2%	Problems with university computational center
12	0.9%	Lack of data about the needs and behavior of users
13	0.6%	Faculty resistance or lack of support
14	0.3%	Difficulty in maintaining system

VI. System Funding.

How was or will the system be funded?

RESULTS: If there was more than one source per category, the approximate percentage of costs allocated, or to be allocated, from each source, was shown. If different functions [acquisitions, cataloging, circulation, online catalog) were funded from different sources, this was also indicated.

The percentages are an average of the 29 libraries that responded to this question. The percentages show the percentage of the cost that will come from each source, e.g., under "Development/Analysis Costs", 54.0% of those costs will come from the regular library budget, and under "AVERAGE" 42.4% of all costs will come from the regular library budget.

Source of funding	Development/ Analysis Costs	Hardware Costs	Software Costs	Maintenance Costs	AVERAGE
Regular library budget	54.0%	25.7%	22.8%	67.3%	42.4%
Special university allocation	18.9%	46.7%	41.6%	22.7%	32.5%
Outside grant	10.2%	6.7%	10.2%	1.7%	7.2%
Private Donation	1.9%	7.6%	6.5%	0.0%	4.0%
Library/ university endowment	3.1%	8.2%	7.7%	3.3%	5.6%
No funds. Work done by univ. computation center	11.9%	5.1%	11.2%	5.0%	8.3%

VII. Computer Support.

A. Are computing facilities now provided or will they be provided primarily from:

RESULTS: n = 32 (multiple responses permitted)

21.9% The central campus computer [n = 7]

3.1% A non-central campus computer that the library will share with another university department [n = 1]

68.8% A dedicated library computer. [n = 22]

Multiple responses permitted. Of the 68.8%, the breakdown is as follows:

18.2% Mainframe. [n = 4]. Models specified: 1 - Honeywell L66 DPS/B; 1 - Magnuson M80/43; 1 - CDC Omega 480, Model 3; 1 - unspecified.

72.7% Minicomputer. [n = 16]. Models specified: 4 - unspecified; 3 - GEAC 8000 (with multiple processors); 2 - Tandem NonStop; 2 - IBM Series I; 2 - VAX 11/750; 1 - IBM 4331; 1 - Hewlett-Packard 3000; 1 - Data General Eclipse S/140.

0.0% Microcomputer.

6.2% Not yet determined. [n = 2]

B. What type of system is or will be used for backup should the computer fail?

RESULTS: n - 41 (multiple responses permitted)

36.6%	Computer Output Microform (COM)	[n = 15]
34.1%	Redundant computer systems	[n = 14]
12.2%	Manual files	[n = 5]
7.3%	No backup system intended	[n = 3]
9.8%	Not yet determined	[n = 4]

VIII. Consultants

Have you used (or do you intend to use) outside consultants in the planning, development, or selection of the integrated library information system? If so, for what purpose?

RESULTS: n = 29 institutions responding. Under "we have used/intend to use/may use a consultant", multiple responses were permitted. Percentages shown in that category are of all institutions responding,

55.2% We have not used/have no present plans to use outside consultants [n = 16]

44.8% We have used/intend to use/may use a consultant for: [n = 13]

- 15.0% assistance and direction in the decision-making process
- 15.0% analysis of prepared specifications
- 15.0% develop specifications for hardware (computer, etc.)
- 10.0% help with implementation of the system (prepare training materials, train staff, etc.)
- 7.5% development of specifications/request-for-proposal
- 7.5% develop cost figures
- 7.5% choose a vendor turnkey system or software package
- 7.5% choose necessary hardware (computer, terminals, etc.)
- 7.5% evaluate networking capabilities/possibilities
- 2.5% contract programming
- 2.5% system maintenance
- 2.5% administrative review

-- survey results prepared by Arnold Hirshon

LIST OF INSTITUTIONS SURVEYED

Boston University *
Brown University
Cornell University *
Dartmouth College
Duke University
Emory University
Florida State University
Johns Hopkins University *
New York University
Northwestern University
Ohio State University
Pennsylvania State University
Purdue University
State University of New York at Albany
Syracuse University
University of California at Berkeley
University of California at Los Angeles
University of California at Santa Barbara
University of Chicago *
University of Georgia
University of Houston
University of Illinois
University of Iowa
University of Minnesota
University of Missouri (Columbia)
University of Nebraska
University of New Mexico
University of Notre Dame
University of Oregon
University of Pittsburgh
University of Tennessee
University of Texas (Austin)
University of Wisconsin
University of Washington
Virginia Polytechnical Institute and State University

* - not included in final results (no response).

SELECTED BIBLIOGRAPHY OF RELATED MATERIALS

Allen, Brandt. "An Unmanaged Computer System Can Stop You Dead," Harvard Business Review. November/December, 1982. pp. 77-87.

Hildreth, Charles R. Online Public Access Catalogs: The User Interface. Dublin, Ohio: OCLC, 1982.

"How to Tame the Computer," The New York Times (November 28, 1982). p. F 21.

Nolan, Richard L. "Managing Information Systems By Committees," Harvard Business Review. July/August, 1982. pp. 72-79.